MARCH 7, 1960

American Machinist / Metalworking Manufacturing

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Rebuilding a jet engine at United's San Francisco base—see page 94

Blind-Hole Tapping Can be Painless, page 96

Forging Dies, page 92

Satellite Shops, page 100

automation-

where so much depends on so little

when the tool tip contacts the work

The modern automated production line is a miracle of cost-saving efficiency. But all its ingenious complexity has but one purpose—to bring work and tooling together. *That's* the point where it either pays off or it doesn't.

To assure maximum productivity—hence maximum return on the investment—cutting tools must be sharpened with machine precision. When they are ground on a Heald Model 4 Tool Sharpening Machine, *exact tool geometry* is obtained every time—and cutting edges *last longer*, saving down-time for tool replacement.

This advanced design machine is available for both true-radius and conventional elliptical-point tool grinding. Its fully automatic tool reciprocation assures uniform and repetitive tool tip accuracy and permits one operator to tend several machines at the same time.

Ask your Heald engineer for complete information on the Model 4 Tool Sharpening Machine, or send for Bulletin 2-4-3, Issue 1.

Heald Model 4 Tool Sharpening Machine arranged for true-radius grinding of constant-clearance-angle tools which are ideal for contouring work.

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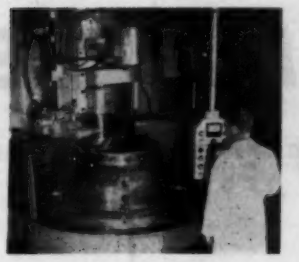
COVER:

Largest single unit ever built by Heald, the 578 vertical, at United Air Lines base in South San Francisco. See page 94



American Machinist / *Metalworking Manufacturing*

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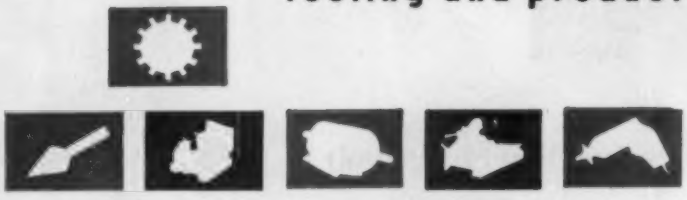
METALWORKING REPORT

Significant current developments in tooling and production processes



CUTTING

More on Ti Carbide

Cutting tools made of titanium carbide have been piling up impressive performance records. They have worked in some operations on which neither regular carbide nor ceramic tools would stand up. For example, silicon steel laminations are finish-turned at 500 sfpm, 0.005 ipr, and 1/32 in. depth of cut. SAE 4140 has been turned at 1800 sfpm, 0.004 ipr, and 1/16 in. depth of cut.

On more conventional operations, these tools have given longer tool life at high speeds than other tool materials in a number of applications. The titanium carbide tools used in these operations was Firth Sterling's WF, a cermet with a titanium carbide base, molybdenum carbide additions, and a nickel binder. There is no tungsten or cobalt in the tool material.

The titanium carbide tools are reported to have high temperature resistance coupled with high crater- and edge-wear resistance. The possible cutting speeds approach those that can be obtained with ceramic tools, but heavier cuts are said to be practical and light interrupted cuts are also possible.

Uranium Ball Valve

One of the largest fabricated uranium products to date is a ball valve that will be machined by Hydromatics, Inc, Livingston, N J, for the AEC's Enrico Fermi atomic reactor. The 10-in. valve (line size) will fit on a shielded cask cart that will carry spent reactor fuel to a disposal area—presumably buried. The ball will weigh over 300 lb, and will be manually operated—but remotely, of course.

Machining will be unlike that for any other ball valve. All chips must be saved and weighed to make sure all the uranium—which is slightly radioactive—is recovered. Any coolant—except possibly water—would contaminate the material, so machining will have to be done dry; and slow. The metal reacts to heat much like magnesium—and the instructions sent along with the job give full details about controlling fire. One method is to immerse the work in graphite chips.

FORMING

Fast Forging Press

Expansion of heavy-forging requirements has prompted Societe Cockerill-Ougree, Seraing, Belgium, to install a 4500-metric-ton press capable of up to 100 strokes per minute. Parts up to 120 metric tons will be forged.

The new press will be one of the most powerful in Europe. Builder is the Chantiers Reunis Loire-Normandie, 7 Rue Auber, Paris. Three main cylinders can be used to develop 1500, 3000, or 4500 metric tons. Pumps for the water supply require a total of 2500 hp.

Control of the press is achieved with a single lever, from a control desk incorporating all functions. Work handling will be accomplished with a 100-ton crane with turn-over device and a hydraulically controlled 60-ton ingot manipulator.

Dimensions of the giant hydraulic forging press are: stroke, 82 ft; maximum vertical opening, 147 ft; size of movable lower table, 16.4 x 13.13 ft; stroke of lower table, 13.13 ft; gross weight, 850 metric tons.

Ring-Rolled Bearings and Gears

Foreign ideas about hot forming of metals are being adopted in several American plants, because there are no domestic counterparts of these processes. Examples are: roller-bearing races, missile parts, bevel-gear blanks, oil-field equipment.

Ring-rolling is a development of Wagner & Co, Dortmund, Germany, for which the American agent is Girard Associates, Chambersburg, Pa. In this process, a doughnut-shaped part is produced on a press, and this shape is expanded and formed into a ring of the desired cross-section, usually in two ring-rolling operations. Not only is this method fast and capable of complete automation, but it avoids flash and thereby saves material.

In the case of bevel gears, one automotive concern is putting in a ring-rolling line to save the 30% or more lost in flash by forging. The ring-rolled gears have satisfactory metallurgical characteristics and run uniform in size, an advantage in subsequent machining. For such reasons another automobile manufacturer is considering two ring-rolling lines for a high-production project.

Further advantages of ring-rolling are: (1) in the case of bearings, bars are the starting shape instead of costly tubing, and (2) a line can be set up for a different product in less than one shift.

Thread Rolling Branches Out

After capturing capscrew manufacturing from the cutting processes, thread-rolling advocates got into rolled splines, and they are now taking on worms and helical gears.

Worm rolling is much more critical than thread or spline rolling because more metal is displaced. However, Landis Machine Co, Waynesboro, Pa, has solved production problems and now has several worm applications. One is a differential power-input wormshaft, used as rolled, for a high-quality riding power lawn mower.

Savings in processing time and material cost are "extraordinary," and the work-hardening effect (with suitable steels) produces durable worms for many applications.

The next logical step is from worms to helical gearing. Visualize rolling a helical spline of the de-

sired involute tooth form on a long slug or bar. Now cut the bar into pinion or gear blanks, face the sides, and bore with respect to the pitch line. This is now being done with speed and accuracy.

Profile is good enough as rolled for many jobs. Finish is excellent. For "super precision" parts, the rolled product can be shaved or, if hardened, finish ground to improve accuracy and noise level. Rolling produces a tooth profile that is exceptionally close to design profile, and final finishing, if required, can be done economically.

INSPECTION

Easier Taper Measurment

Virtually unknown in the USA, but in common use in France, Micyl blocks are half-round gage blocks that simplify taper measurements. They are mounted loosely to V-blocks, against which the rounded sides rest. A tapered part is placed between two block assemblies, with the tapered sides of the part resting against the flats of the half-round blocks. A measurement across the backs of the V-blocks gives the width of taper indirectly—for details, see p 103.

HEAT TREATING

New Treatment for Titanium

One of titanium's major shortcomings has been the lack of alloys capable of being heat treated to high strength levels. Republic Steel Corp's answer to this is a new titanium alloy sheet and a process for heat treating it. The heat-treated sheet can be used in thinner gages, thus cutting weight while holding to specified strength requirements.

Fully-heat-treated RS-140 titanium alloy sheet shows strength of over 190,000 psi, and is being used in aircraft or missile skins, stiffeners, engine nacelles, bulkheads, and heat shields.

Titanium sheets, specially coated to prevent contamination by atmospheric gases, are heated for short periods at a temperature between 1400 and 1700 F (depending on the specific alloy) in an electrically heated continuous roller-hearth furnace. The furnace delivers the heated sheets directly to a continuous water quench. In this soft condition the material can be hot or cold formed, then aged for several hours at 900-1000 F to develop the high strength.

The process, developed primarily for the new RS-140 alloy but applicable to other heat-treatable alloys as well, provides alloy sheets free of surface contamination, with better flatness and more uniform properties than ever before.

THE OUTLOOK

Metalworking production continues to rise to new heights. Latest index figures (see page 83) show production up about 12% over a year ago and up four points since last month. Rate of increase is being tempered by the cutbacks in automobile production. New machinery orders are now expected to reach their peak in the third quarter (see page 90).

WELDING

Home-Made Oxygen

A new transportable unit can produced an unlimited supply of oxygen from the atmosphere. Operating on 110-v current, it filters out contaminants and extracts and delivers the oxygen in less than a minute after it is turned on.

The unit is called the AerOxy-Gen and was developed by the Chemical Div of Aerojet-General Corp. It is housed in a 2-ft-square cabinet and weighs only 150 lb. Gasoline- or battery-powered units will operate under field conditions.

The oxygen is delivered at 5 psi, but Aerojet claims the equipment will have wide application in industrial welding and cutting.

ASSEMBLY

Fast Fastening

One screwdriver spindle assembles five screws in five seconds to join a sheet-metal cover to a plastic housing at an appliance plant. Fast action is possible because interlocking controls operate opposed air cylinders that move two slides at right angles to locate a workholding table under the Dixon single-spindle screwdriver. Flow controls and cushioned cylinders move the table without impact, and position it within 0.002 in. For details, see p 100.

FINISHING

Ultra-Hard Coating for Aluminum

A new electro-chemical process has been developed by Toro Mfg Co, Minneapolis, and is claimed to produce a 0.002-in. film of aluminum oxide with a hardness approaching that of diamond or sapphire. Details have not been revealed, but it is understood that the secret lies in the application of extremely high current densities without burning.

The process resulted from the company's search for an abrasion-resistant lawnmower reel, and is said to challenge older hard-coating methods by its greater electrical efficiency, lighter color of the end product, and by the speed of application, which is said to be 10 to 50 times faster.

Anticipated uses are in helicopter blades, pistons, gears, and other automotive parts, as well as for architectural parts and kitchen utensils.

MATERIALS HANDLING

Handling in the Future

The materials-handling industry now has the means and the knowledge to design handling equipment for integration in the automated processes of the future. That's the opinion of Yale & Towne's John A Baldinger, made in a recent address to a chapter of the American Material Handling Society. Among future technical developments-to-watch, Baldinger cited the following:

1. A fork truck which accepts radio-wave commands, beamed from a distance, that control every normal motion (including brake application and horn blowing).
2. Fuel cells that generate electricity by oxidizing gases in a converter.
3. New transmissions that speed operations and cut maintenance.
4. Gas turbines for heavy-capacity lift trucks.

MATERIALS & COMPONENTS

Power Failure Downtime

Very few people really know what downtime as a result of power failure really costs them, according to Houston Jones, of General Electric's Low-Voltage Switchgear Dept in Philadelphia. Surveys and close estimates show the cost varies from $3 to $500 per minute. The median is $88 per minute and it is rising with the increase of automatic equipment.

Most manufacturing management

METALWORKING REPORT . . .

people make a major effort to minimize downtime resulting from equipment malfunction without fully recognizing the critical function of their power distribution systems. Reliability in the power distribution system is especially important because failure usually affects more than one piece of equipment.

Analysis of the distribution system, and the demand on it, plus merely physical rearrangement of the same basic elements can contribute substantial service reliability.

Plastic-Tool Savings

In 80 production departments, the General Electric Co saved more than $3 million by using plastic tools during 1959. This is a saving of approximately 5% of the company's average annual $65 million tooling expense. The program was greatly enhanced by a plastic-tooling training course given to more than 200 people by the Manufacturing Laboratory at Schenectady, NY. Dies, strippers, fixtures, drill jigs, foundry patterns, surface plates, templets, and prototypes are among the items produced in plastic.

MANUFACTURING CONTROL

Super-Fast Printout

When a computer "talks," it's usually through some form of automatic typewriter. Such a slow-acting printout device can't possibly translate data as rapidly as a computer can compile it. A new electronic setup, based on television principles, promises to narrow the time lag between computer performance and printout.

The new computer-to-man communicator makes use of two units recently developed by research engineers at the Stanford Research Institute. First of these is a high-speed printing device, called the Videograph, that can turn out printed copy at nearly 20,000 characters second.

Second unit is a monoscope tube (similar to a television camera) that connects the computer to the Videograph. Built into the tube is a target disk that contains 64 printed figures and symbols. In operation, six output wires from the computer are the input to the monoscope tube, and each of their various combinations causes the enclosed electron beam to scan one of the figures. Then, as in any television camera, that figure is transmitted either to the printer or to a viewing screen—or both.

In the visual display, the operator can select portions of a message to be viewed as long as desired on the screen of the Videograph. Or the message can be run in its entirety and then stored. Type faces and symbols on the target disk of the monoscope are photoengraved, can be any style; thus the printout is much easier to read than the usual computer printout.

More on Computers

Use of computers in production control is becoming widespread in large companies. What computers can do and cannot do is still the subject of wide debate, but almost every week reports of new uses for computers come in. Here are two recent developments:

- A Westinghouse plant has worked out a computer program, "approaching total pre-production planning," for the manufacture of large ac motor coils. Required service characteristic for these coils are fed into a Univac I computer, which then calculates complete design specs for the coils and prints a coil drawing with dimensions, bill of material, and other pertinent design information. The design output tape then becomes input for further data processing. Result is a printout that includes work-station routing, detailed manufacturing operations in sequence, and labor standards for the operation.
- At the Norair Div of Northrop Corp, an IBM 704 computer has been hooked up with automatic data-transmitting equipment (the Collectadata of Friden Corp). In the latter system, an edge-punched card follows an order through production; at work stations, cards are inserted in small transmitters that automatically convey production information to a central station, where the data is collected on paper tape. This paper tape is transferred to the computer center, converted to magnetic tape, and fed to the computer. New system reportedly eliminates manual reports that would fill two boxcars annually.

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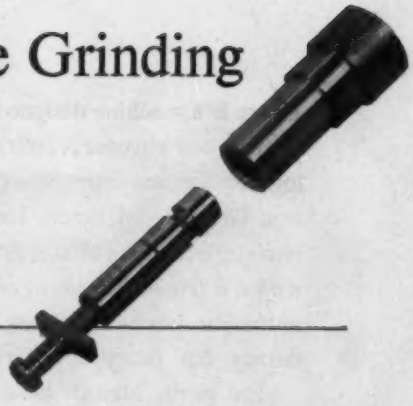
CINCINNATI

Matched-Hole Grinding within *Millionths* of an Inch



Mating parts require extreme accuracy, whether they are missile control components, fuel injection plungers, high pressure hydraulic valves, or similar shaft-like parts mated to prefinished bushings. If you are engaged in any kind of work requiring critical accuracies you will be interested in the following . . .

Cincinnati has developed a super precision grinding machine in combination with a remarkable gaging system, that grinds the OD of a shaft-like part to a preselected clearance with the prefinished ID of its mating part . . . within tolerances of .000010" for roundness, .000020" for straightness, ±.000020" for size, and a surface finish of 2 to 4 micro-inches. Grinding to these tolerances, at a semi-automatic production rate, completely eliminates the need for subsequent lapping operations. In addition, slight variations in hole size will not slow down production.

The key to matched-hole grinding within such close tolerances is Cincinnati's exclusive Grind-A-Mate gaging system. Specially designed by Cincinnati engineers, Grind-A-Mate consists of two sets of opposed air jet gage heads for measuring the ID and OD of mating parts. These gage heads are integrated with a high amplification differential meter which continuously measures the difference between the two diameters. Desired clearance between the mating parts is adjusted by a single dial on the meter. Mating parts are automatically ground to this preset clearance, regardless of individual ID variations. The OD gage is designed so that it will not touch the work diameter, thus eliminating any chance of chatter, marring or taper due to pressure of the gage.

Total stock removal in matched-hole grinding is from .0003" to .0006". To set up, the operator adjusts the OD and ID gages from masters, and dials in the desired clearance. He then places a bushing over the ID gage, positions the work between centers, swings the OD gage head into position and starts the automatic grinding cycle. Coarse feed, fine feed, controlled dwell to size, rapid retraction . . . all are controlled by Grind-A-Mate gaging system.

To obtain these precision results in matched-hole grinding it is necessary to have an extremely accurate machine. The new CINCINNATI *4" Super Precision Grinder has been specially designed, built and equipped for this type of work. Some of its features are described on the next two pages, and complete details may be obtained by writing for Catalog G-730.* GRINDING MACHINE DIVISION, THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO.

New CINCINNATI 4″ Super

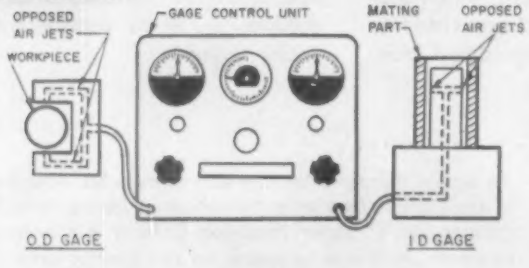
gives you ultra-high accuracy

Here is a machine designed and constructed for just one purpose... ultra-precision grinding. On the new CINCINNATI 4″ Super Precision Grinder, tolerances for size, roundness, straightness and surface finish are obtained *within a few millionths of an inch,* on a semi-automatic production basis. This extreme accuracy has many applications for grinding critical parts, such as missile control valves, fuel injector plungers, and a variety of other mating or shaft-like parts requiring extreme precision.

For maximum stability the new 4″ Super Precision Grinder incorporates heavy duty castings with extra ribbing. All alignments and center heights are held to tolerances approaching the vanishing point. Motors are super balanced, and both cutting fluid and hydraulic tanks are isolated from the machine to eliminate vibration. A special dual rate automatic infeed unit provides rates as low as .0002″ per minute. Cincinnati's Gage-Line unit assures extremely accurate taper adjustment, without trial and error or bothersome calculations; footstock tension adjustment and temperature are regulated with equal precision.

Cincinnati's exclusive Grind-A-Mate gaging system completely controls the automatic grinding cycle. Parts may be matched ground to preset clearances throughout prolonged production runs, regardless of diameter variations. Our Grinding specialists will be glad to provide further information regarding your particular application. Complete details may be obtained by writing for new Catalog G-730.

CINCINNATI'S EXCLUSIVE GRIND-A-MATE GAGING SYSTEM *controls the entire automatic grinding cycle. Air jet gages continuously measure both the OD of workpiece as it is precisely ground (at left), and the ID of the mating part; and constantly indicate on a high amplification differential meter (below) the variation between the two diameters. Desired clearance between mating parts is preselected by operator on one dial.*



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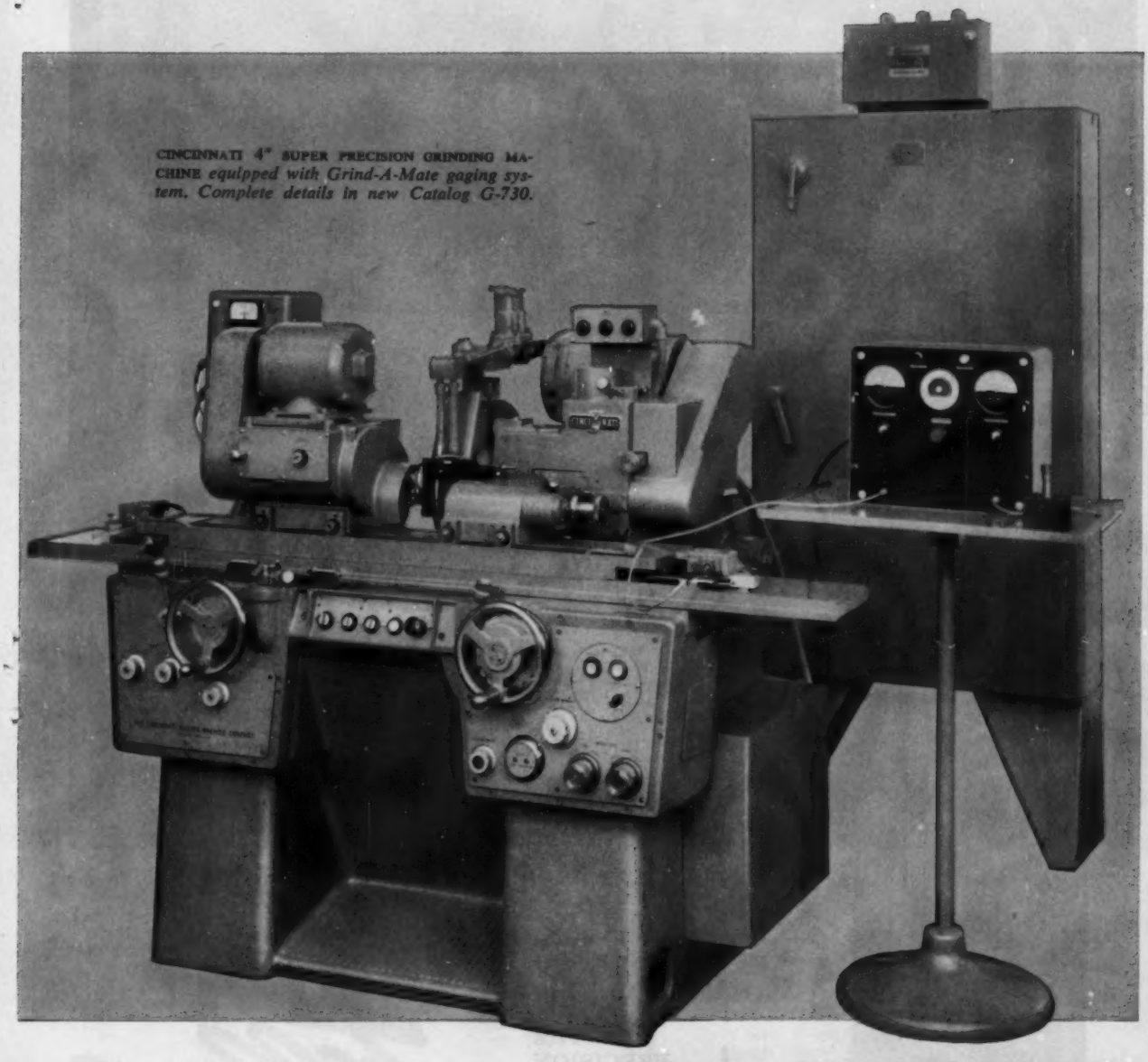

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FELLOWS GEAR PRODUCTION Builds Extra Quality

View of production floor at Stanley Electric Tools, showing some of the Fellows Gear Production Equipment used.

Gears produced with Fellows Machines add high quality to these Stanley Electric Tools.

THE PRECISION LINE

Fellows

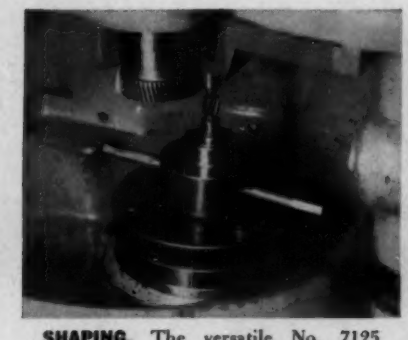
EQUIPMENT at Lower Cost for STANLEY

Stanley is a name you know . . . a name that stands for high quality in electric tools.

To insure this quality, while providing the high production rates that mean lower costs, Stanley Electric Tools, Division of The Stanley Works at New Britain, Conn., uses Fellows Gear Production Equipment for shaping, shaving and inspecting the armature pinions for its electric tools.

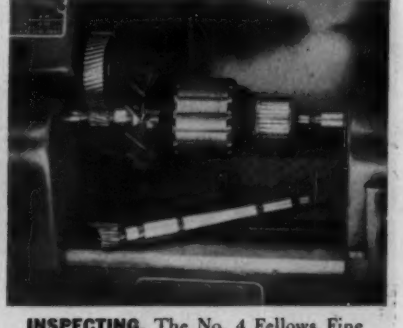
Fellows has long been the leader in Gear Production Equipment, with machines for every gear production job: Fellows Gear Shapers, Pfauter Gear Hobbers, Fellows-Reishauer Gear Grinding Machines, Fellows Gear Shaving Machines and Fellows Inspection Instruments.

If you make gears of any size, from 1/16″ P.D. to 120″ P.D., Fellows' 60 years of experience can help you improve quality and cut costs. For complete information on Fellows Gear Production Equipment, call your nearest Fellows office.



SHAPING. The versatile No. 7125 Fellows Gear Shaper gives Stanley high production speeds (up to 450 strokes per minute). It also provides fast, simple changeover from one job to another.

SHAVING. The No. 4 Fellows Fine Pitch Shaving Machine puts finishing touches on each pinion and adds the finish which results in long life and quiet operation.



INSPECTING. The No. 4 Fellows Fine Pitch Red Liner makes and records a composite check of gear accuracy, insuring high quality standards.

Gear Production Equipment

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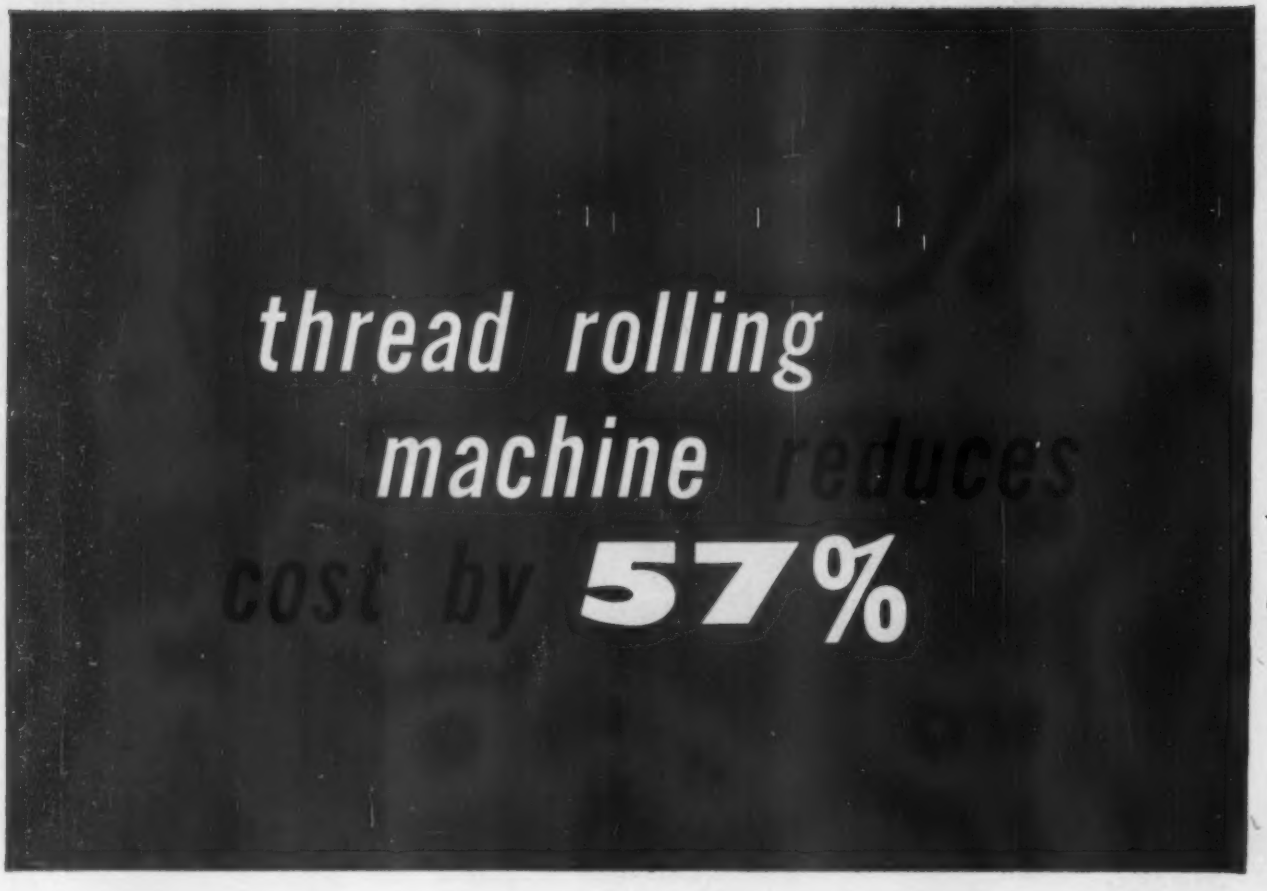
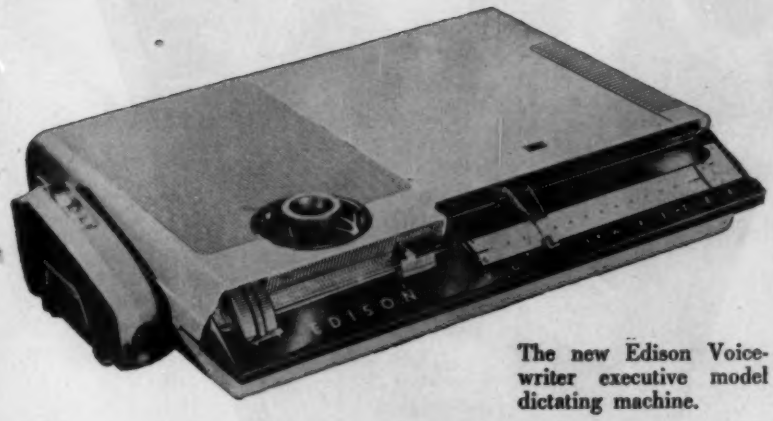
6214 West Manchester Avenue, Los Angeles 45

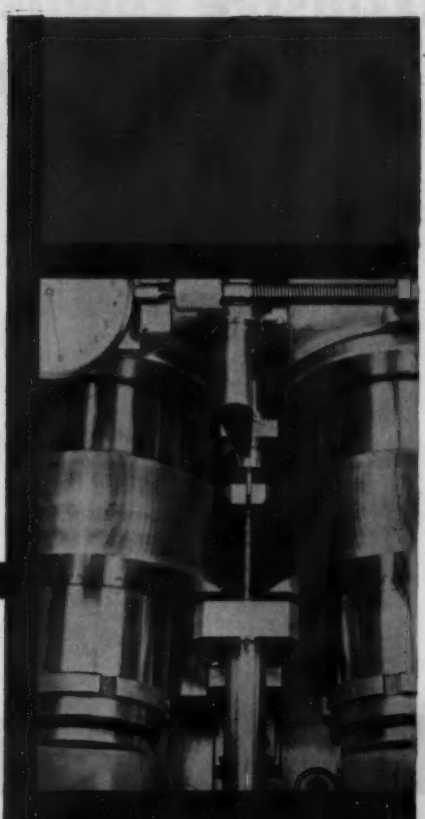


LANDIS Machine COMPANY WAYNESBORO • PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT



The new Edison Voicewriter executive model dictating machine.



As a result of the versatility and high production of the LANHYROL Thread Rolling Machine, Thomas A. Edison Industries (McGraw-Edison Company), West Orange, New Jersey, is able to roll threads on a feed screw used in their Voicewriter dictating machine at a cost reduction of 57% as compared with having the job done by an outside vendor.

The cost-cutting benefits alone justify the purchase of the LANHYROL Thread Rolling Machine, but such things as an improved product, better able to meet exacting tolerance requirements, more efficient production control, and a reduction in materials handling and transportation cost are all advantages of rolling the part on the LANHYROL.

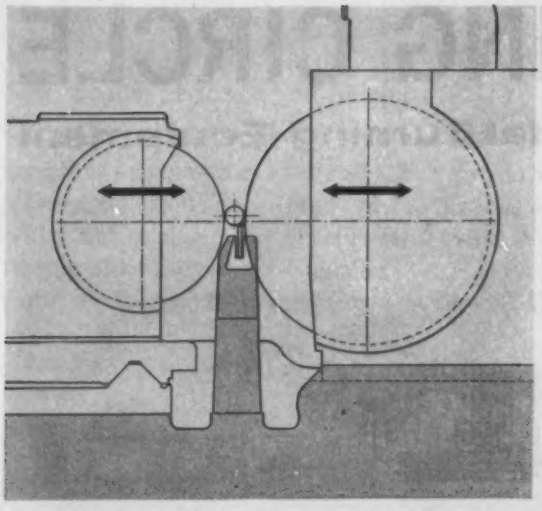
For instance, improving the product also meant a reduction in intangible costs such as a reduction in the readjustment of instruments due to variation in the previous manufacturing methods and the elimination of delays in production due to parts variations.

The LANHYROL Thread Rolling Machine produces strong, accurate threads of excellent finish by the chipless, cold-forming process using three different Rolling methods—Infeed, Thrufeed (as in this operation), and Continuous as required by conditions of workpiece design, material hardness or thread specifications. It will thread all diameters from 3/16" to 3", producing left-hand and right-hand threads of all types (except square), including UNC, UNF, Acme, worm, and many special forms. In addition to wide range coverage, the design provides a means for rapid size adjustment and versatility of application. Completely automated threading operations can also be obtained by hopper or magazine feeding.

Please send your specifications and let us show you how you can realize the cost saving benefits of the LANHYROL Thread Rolling Machine. Ask for Bulletin E-60.

Exclusive Landis work rest design gives high

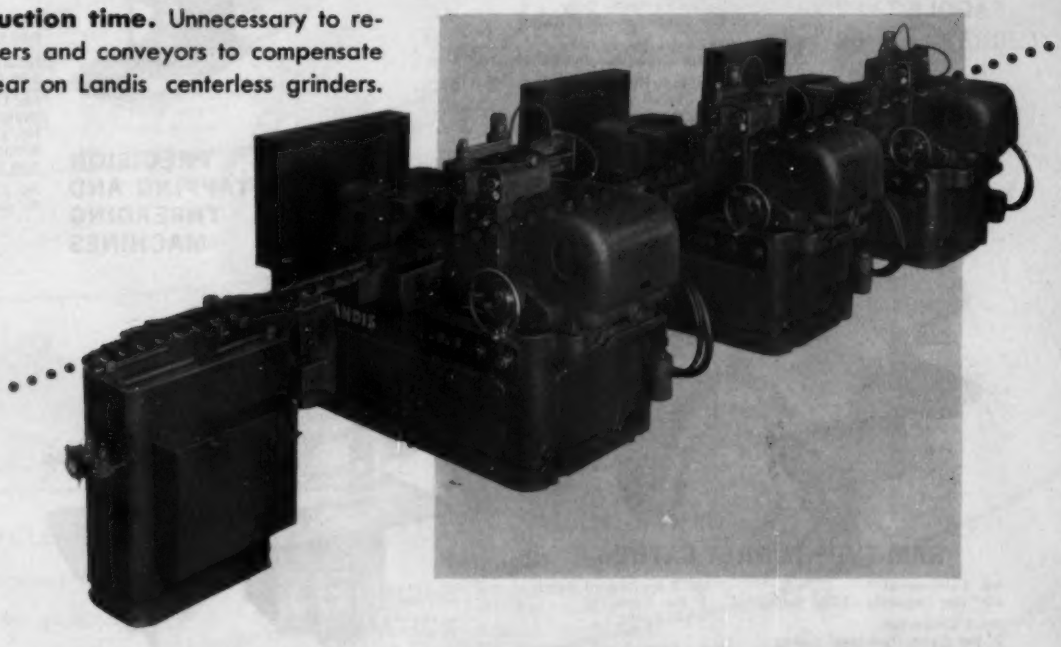
centerless output *plus* close tolerances



Landis method of centerless grinding. Extra heavy cuts can be taken with this rigid, bed mounted work rest.

Solid support for accuracy and finish. Close tolerances and fine finishes maintained at high production rates,

More production time. Unnecessary to re-position loaders and conveyors to compensate for wheel wear on Landis centerless grinders.



LANDIS TOOL COMPANY

WAYNESBORO, PENNSYLVANIA

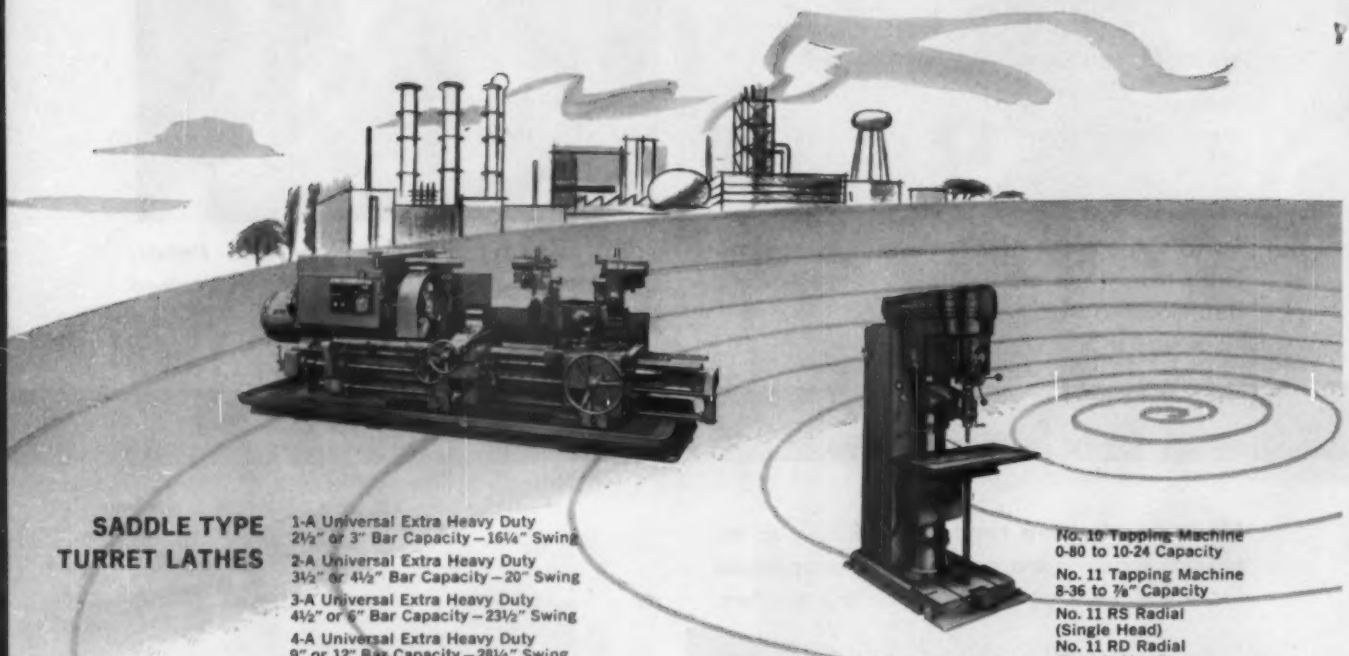
MMT-PE

LANDIS

precision grinders

THE WIDENING CIRCLE

of Warner & Swasey Metal Turning Equipment



SADDLE TYPE TURRET LATHES

1-A Universal Extra Heavy Duty
2½" or 3" Bar Capacity – 16¼" Swing

2-A Universal Extra Heavy Duty
3½" or 4½" Bar Capacity – 20" Swing

3-A Universal Extra Heavy Duty
4½" or 6" Bar Capacity – 23½" Swing

4-A Universal Extra Heavy Duty
9" or 12" Bar Capacity – 28¼" Swing

5-A Universal Extra Heavy Duty
12" Bar Capacity – 36" Swing

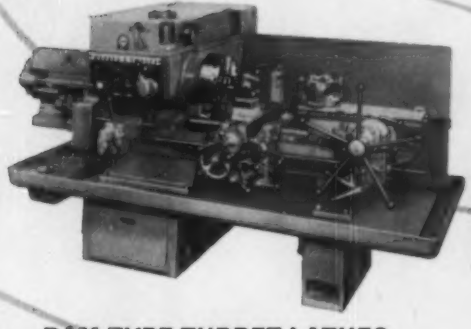
PRECISION TAPPING AND THREADING MACHINES

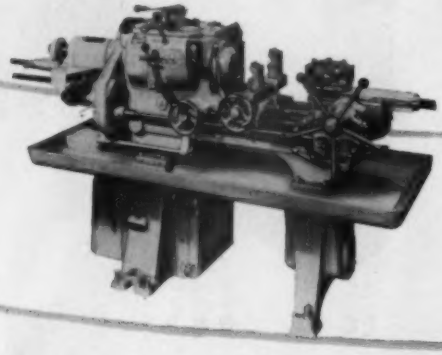
No. 10 Tapping Machine
0-80 to 10-24 Capacity

No. 11 Tapping Machine
8-36 to ⅞" Capacity

No. 11 RS Radial
(Single Head)
No. 11 RD Radial
(Double Head)
8-36 to ⅞" Capacity

No. 12 Tapping Machine
⅜" to 2½" Capacity





RAM TYPE TURRET LATHES

No. 3 Universal
1½" Bar Capacity – 15⅜" Swing

No. 4 Universal
2" Bar Capacity – 18⅛" Swing

No. 5 Universal
2½" or 4½" Bar Capacity – 20" Swing

No. 2 All-Geared Head
1" Bar Capacity
14" Swing

You can produce it better, faster,

CIRCLE 163 READER SERVICE CARD

NOW—Warner & Swasey offers you a more complete line of metal turning machines than ever before. There is a proper size and type for every turning need. Each model has been designed with three fundamental user-benefits in mind:

1. To handle specific work ranges for greater production efficiency.
2. Maximum accuracy and longest life.
3. Faster setups and easier operator handling.

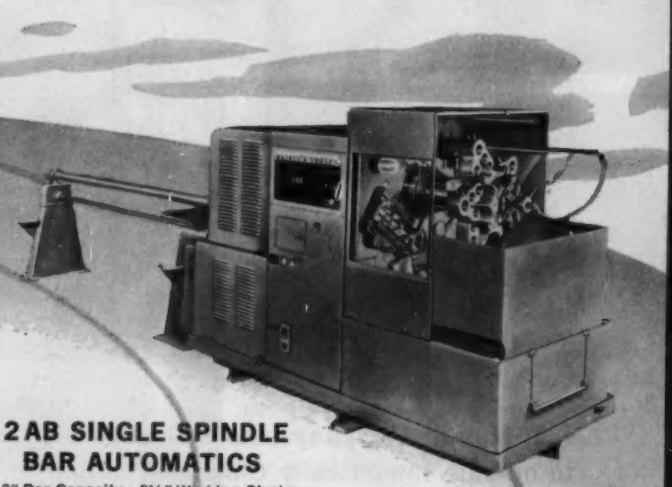
No other machine tool producer offers you so wide, so versatile a range of "profit-engineered" metal turning equipment —why not explore your specific needs with a Warner & Swasey Field Engineer. Write us, Warner & Swasey Co., Cleveland 3, Ohio.

SINGLE SPINDLE CHUCKING AUTOMATICS

1AC Chucking Machine
8" or 10" Chuck—
6" Working Stroke

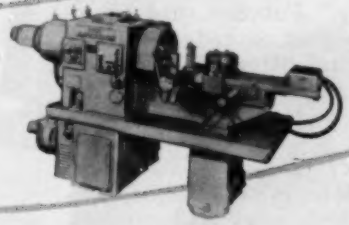
2AC Chucking Machine
10" or 12" Chuck—
9" Working Stroke

3AC Chucking Machine
15" Chuck—
11" Working Stroke



2AB SINGLE SPINDLE BAR AUTOMATICS

3" Bar Capacity—9½" Working Stroke



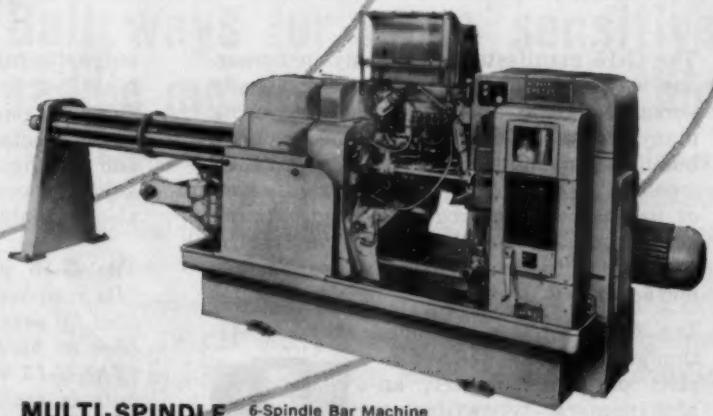
ELECTRO-CYCLES®

No. 1 Electro-Cycle
⅝" Bar Capacity—11" Swing

No. 3 Electro-Cycle
1½" Bar Capacity—15⅜" Swing

16" Electro-Cycle
1½" Bar Capacity—16⅞" Swing

® Reg. U. S. Pat. Off.



MULTI-SPINDLE AUTOMATICS

6-Spindle Bar Machine
1¼" Bar Capacity

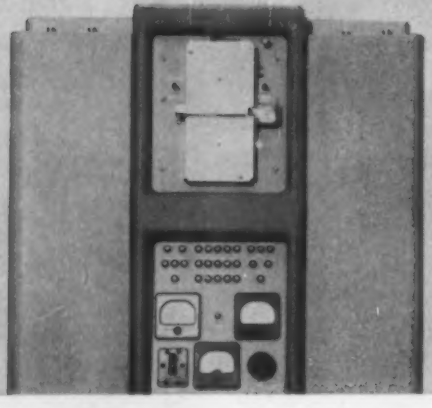
5-Spindle Bar Machine
1¼" Standard Bar Capacity
2¼" Oversize Capacity

5-Spindle Chucking Machine
6" Swing

for less...with a Warner & Swasey

CIRCLE 164 READER SERVICE CARD

"Numerical control really pays off using the Bendix G-15 computer"



Joseph Strack

JOSEPH STRACK,
SENIOR TOOL ENGINEER
& PROCESSMAN
THE MARTIN COMPANY,
BALTIMORE DIVISION

The Martin Company uses a Bendix G-15 digital computer for producing punched tapes to operate numerically controlled milling machines. *"Parts are produced in one-fourth the time required by conventional milling,"* Strack writes, *"and comparing price with all other computers used for numerical control, the G-15 stands at the head of the list for economy."*

The G-15 manifests its economy in numerous ways. For example, it is exceptionally versatile. Over 250 are in use covering many facets of engineering, the sciences, business and industry. *"Although the G-15 was installed for a special purpose, its ease of use and various ways of programming have impressed me. It performs our specific task perfectly, and easily solves various mathematical problems."*

The G-15 can be expanded at will. Although the basic G-15 consists of the computer, an alphanumeric typewriter, a high-speed tape reader and tape punch, the user may add accessories to accommodate growing work loads. *"Added storage offered by magnetic tape units enables us to use combinations of routines interchangeably and fully automatically."* Punched card equipment, special high-speed paper tape readers and punches, a digital differential analyzer, a high-speed plotter, and other units are also available.

The G-15 pays off in ease of operation. *"Its simplicity enables the G-15 to be operated by personnel with no computer knowledge or background . . ."* In time savings, *"The G-15 has cut lead time tremendously, both in tooling and part manufacture."*

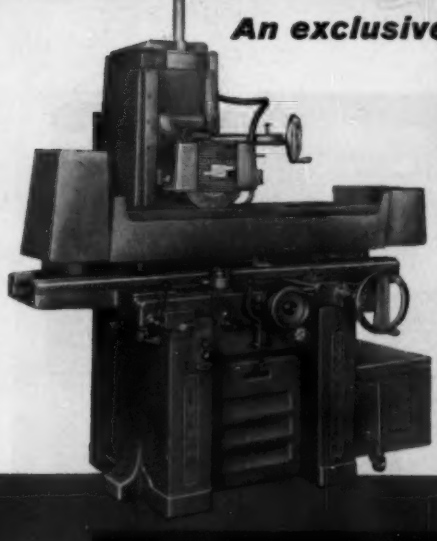
Write for detailed information.

Bendix Computer

DIVISION OF BENDIX AVIATION CORPORATION

LOS ANGELES 45, CALIFORNIA
DEPARTMENT AA -19

Underside of saddle shows ¾" ball bearings, hardened and ground steel ways and precision ground feed screw.



An exclusive Hydrabrasive surface grinder feature . . .

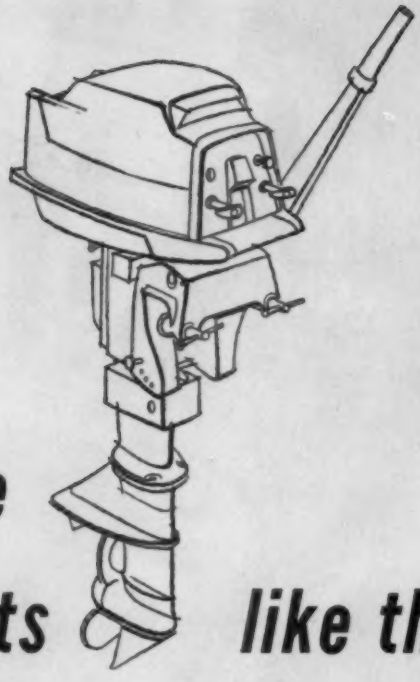
Ball ways for more sensitive saddle movement and longer life

This feature, which is standard equipment on Landis Hydrabrasives, gives you more accuracy at no extra cost. It will help your operators get the most from their skills and give you highest precision on piece after piece.

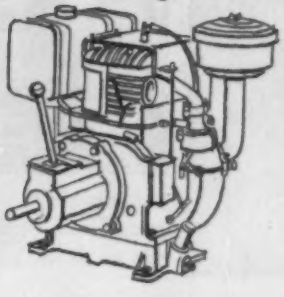
Landis Hydrabrasive Surface Grinders are made in 4 sizes: 8" x 24", 12" x 18", 12" x 24" and 12" x 30". The standard 12" grinding wheel is driven by a 3 hp motor. Larger wheels and motors are available.

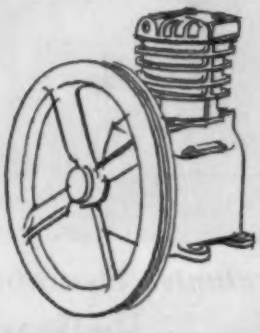
HYDRABRASIVE
precision surface grinders

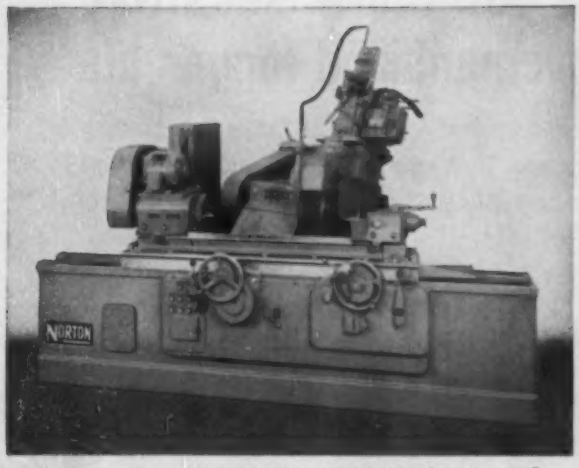
a product of
LANDIS TOOL
world's largest manufacturer of precision grinding machinery
WAYNESBORO, PENNSYLVANIA



If you make products like these.....



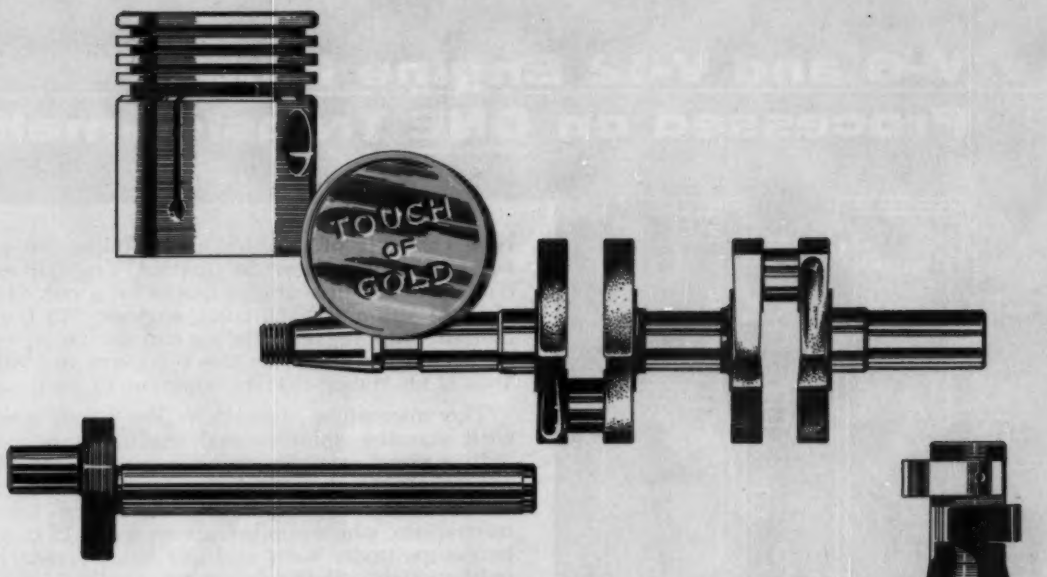




A Norton Type CV-4 Angular Wheelslide Grinder, 10" semiautomatic, grinds the bearing diameters and adjacent shoulders of the outboard engine crankshaft shown above. Two other Norton machines are used in grinding this part: a 10" Type LCTU for the center main bearing and a 10" Type CTU CRANK-O-MATIC* crankpin grinder for the throws.

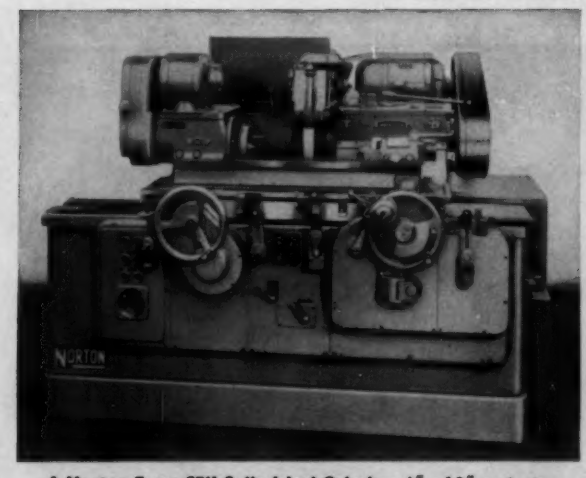
A Norton CAM-O-UNIT* Mechanism attached to a Norton Type CTU cylindrical grinder. This smooth-working grinding team broadens the scope of a proved cylindrical grinder, assuring excellent, low-cost grinding of the small piston and the motorcycle camshaft shown, as well as other special shapes.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries



grind parts like these...

on NORTON machines



A Norton Type CTU Cylindrical Grinder, 6" x 18" semiautomatic, with live spindle headstock, is used for grinding the household refrigerator compressor shaft, shown above. Areas ground are the short off-set diameter, the shoulder and part of the shaft — typical of the Type CTU's ability to perform several grinding operations at one time.

The longer it takes you to grind parts for popular, mass-produced products, the more it costs you. If your grinding machines are below par, so are your profits.

Norton grinders can help you cut production time and costs to the very lowest. You have plenty to choose from — cylindrical, angular, crankpin and other grinder types, together with CAM-O-UNIT mechanisms that enable CTU machines to grind cams and special shapes with precision accuracy.

Norton grinders — all of them — are engineered for fast, accurate, easy operation, simplified maintenance and long, trouble-free service life. By combining several grinds in one job, a single Norton machine for your production can easily replace two or more ordinary grinders.

Your Norton Man, an expert grinding engineer, is always ready to help you select the grinding equipment you need to improve product quality and build your profits. NORTON COMPANY, Machine Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

NORTON

GRINDERS and LAPPERS

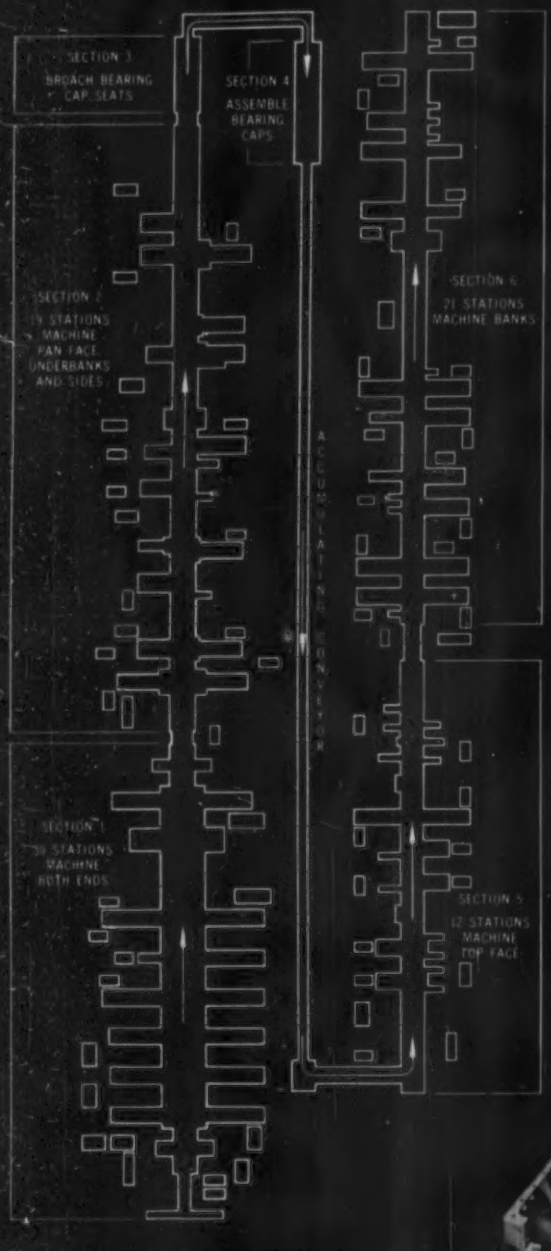
Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electro-Chemicals — **BEAR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

CIRCLE 168 READER SERVICE CARD

CIRCLE 169 READER SERVICE CARD ►

V-6 and V-12 Engine Blocks Processed on ONE Transfer-matic



Floor plan layout of the sectionized Transfer-matic. The illustration on the right is Section 1 and 2.

New concepts of production flexibility are engineered into this new Sectionized Transfer-matic created to machine engine blocks for a new family of large V-6 and V-12 truck engines. 579 boring, reaming, tapping, chamfering and spotfacing operations are performed on the V-6 parts and 901 on V-12's. Of these, 454 are common to both parts.

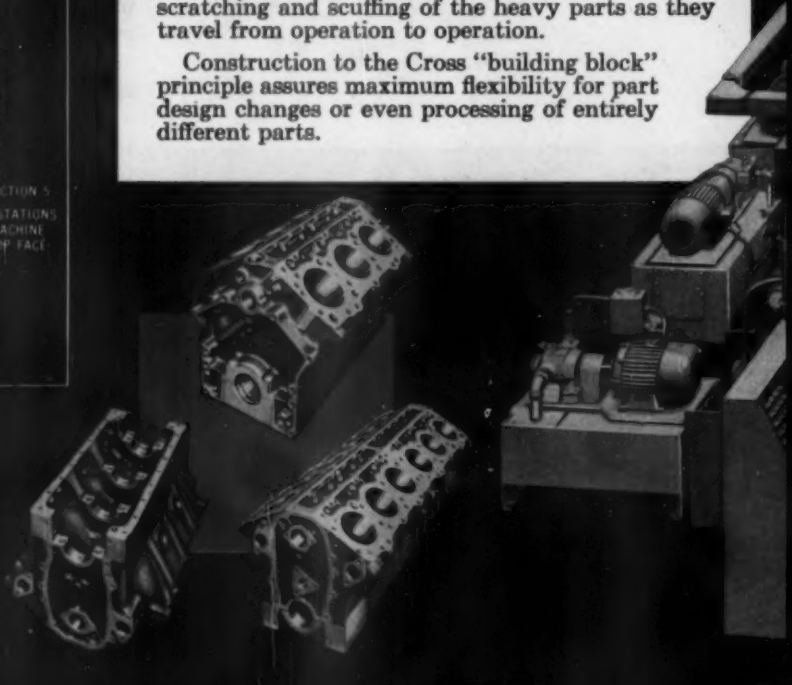
The uncommon operations are taken care of with standby spindles and machine units, and with a novel two-step transfer mechanism which reduces the number of spindles required to machine the V-12 by approximately 50%. The transfer mechanism, where applied, allows the V-12 to make two stops under each multiple head (heads have only enough spindles to process the V-6). At the first stop, the front half of the V-12 is machined, and at the second stop, the rear half. V-6's move through the machine in a conventional manner stopping under each head only once.

Capacity of the line operating at 100% efficiency is 65 V-6 blocks per hour, or 35 V-12's.

The line is divided into sections with provisions for banking between each section. Thus, it is possible to be producing V-6's in some sections, V-12's in others and to be making a changeover in still another section, all at the same time.

Cross lift and carry transfer mechanisms prevent scratching and scuffing of the heavy parts as they travel from operation to operation.

Construction to the Cross "building block" principle assures maximum flexibility for part design changes or even processing of entirely different parts.



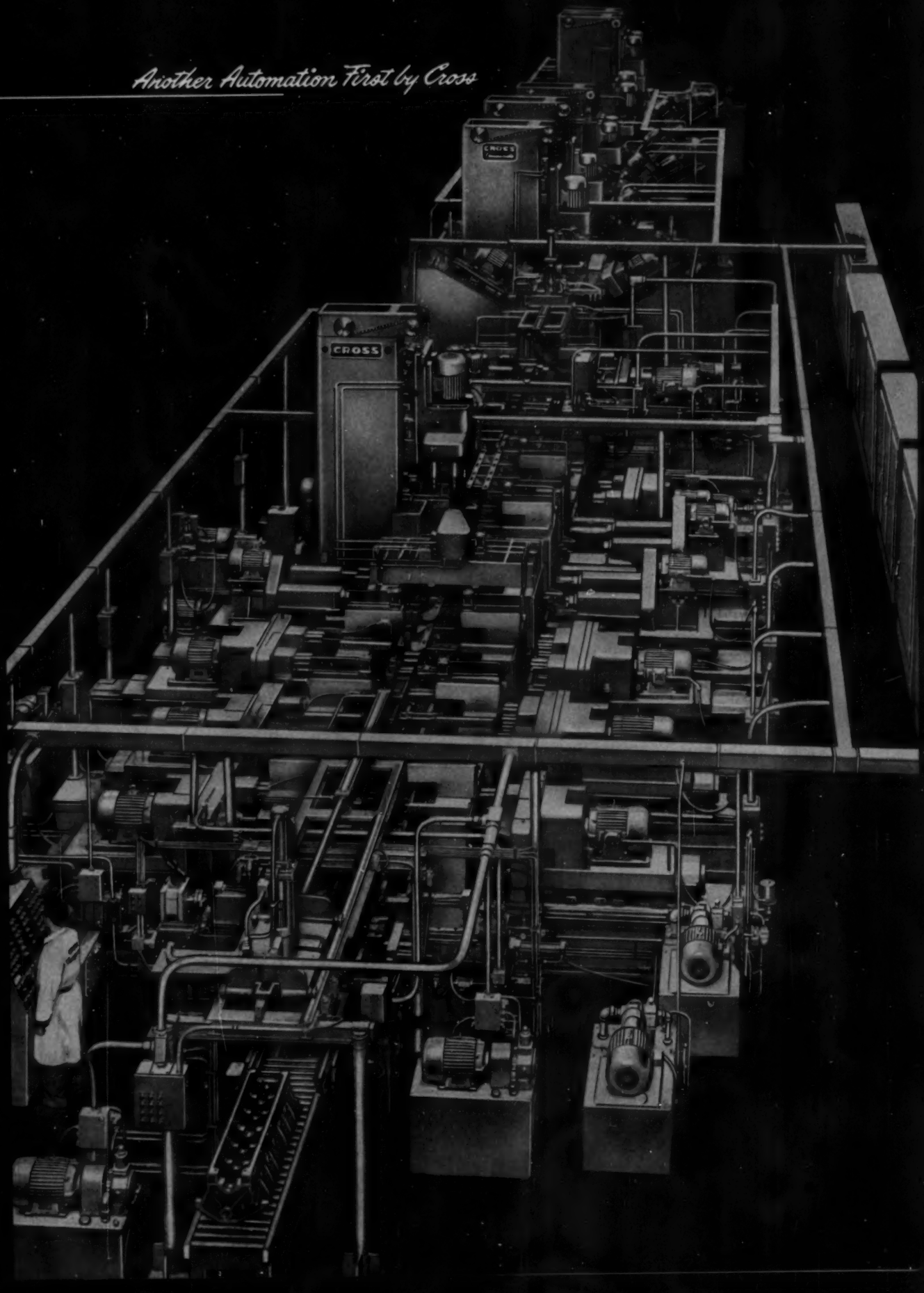
Established 1898

THE CROSS CO.

First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN

Another Automation First by Cross



When you are buying
BROACHING TOOLS
. . . be sure you buy the best!

Here are some reasons why you should specify
BROACHES by LAPOINTE

They are expertly designed, by broach engineers with a background of Lapointe's nearly 60 years of experience in broaching.

Our broaches are ground to precision tolerances by experienced broach grinders with 30 to 35 years' know-how.

Heat treating in our own modern atmosphere-controlled electric furnaces assures consistent, uniform and correct hardness of our broaches.

Lapointe quality control begins with the high speed steel, poured to our own specifications.

Each broach is inspected after every operation. Prior to shipping they are given a final inspection under a 30-power Stereomicroscope.

You can save money with Lapointe broaches, by getting:

- **more parts per sharpening**
- **more sharpenings per broach**
- **lowered broach inventory**
- **reduced scrap rate**

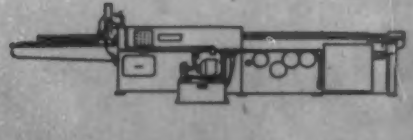
Plants that keep performance records on their broaching tools have learned that it pays to buy the best: LAPOINTE.

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

Lapointe-built Broaching Machines are available in hydraulic and electro-mechanical drives.



60" STROKE HORIZONTAL, ELECTRIC

CH CONTINUOUS BROACHING, ELECTRIC

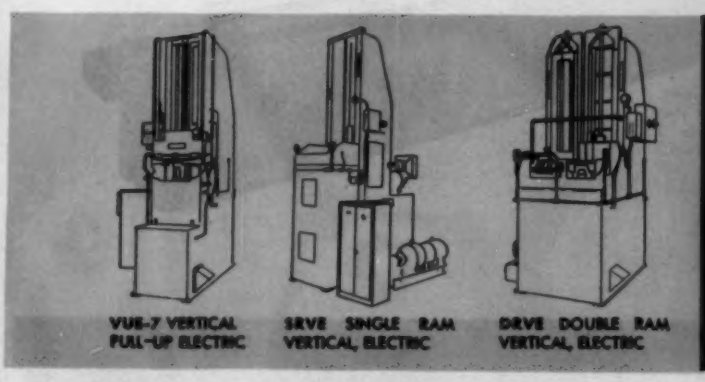
SRHE SINGLE RAM HORIZONTAL, ELECTRIC

◄ CIRCLE 170 READER SERVICE CARD

CIRCLE 171 READER SERVICE CARD

MMT=PE

Lapointe's the leader in the production of broaching tools. These tools have always been a major portion of our business, and the tremendous quantity of broaches that we manufacture is an indication of our outstanding reputation for perfection in this field. All types of broaches are designed and made at Lapointe, broaches for automotive involute gears, "pine tree" form broaches for jet engines and stationary gas turbines, and all the conventional types of surface and internal broaches.



VUE-7 VERTICAL PULL-UP ELECTRIC

SRVE SINGLE RAM VERTICAL, ELECTRIC

DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING

CIRCLE 172 READER SERVICE CARD

....only with hydraulic design

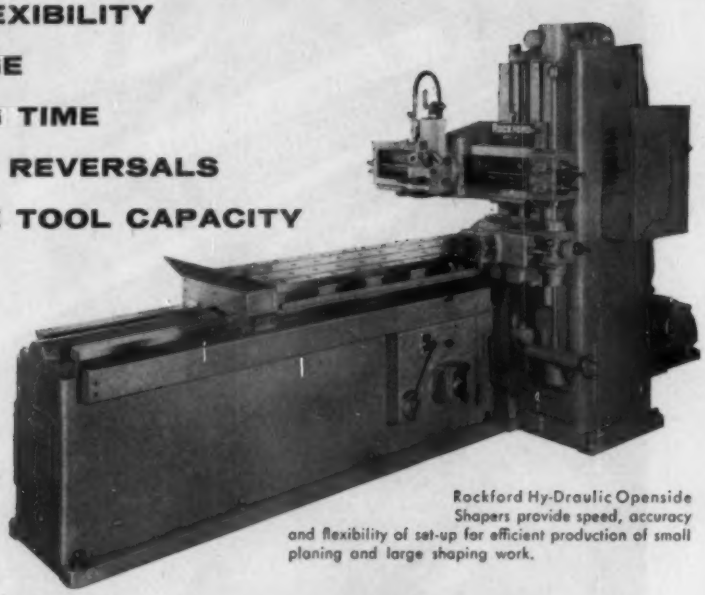
GREAT SET-UP FLEXIBILITY

WIDE WORK RANGE

SHORT MACHINING TIME

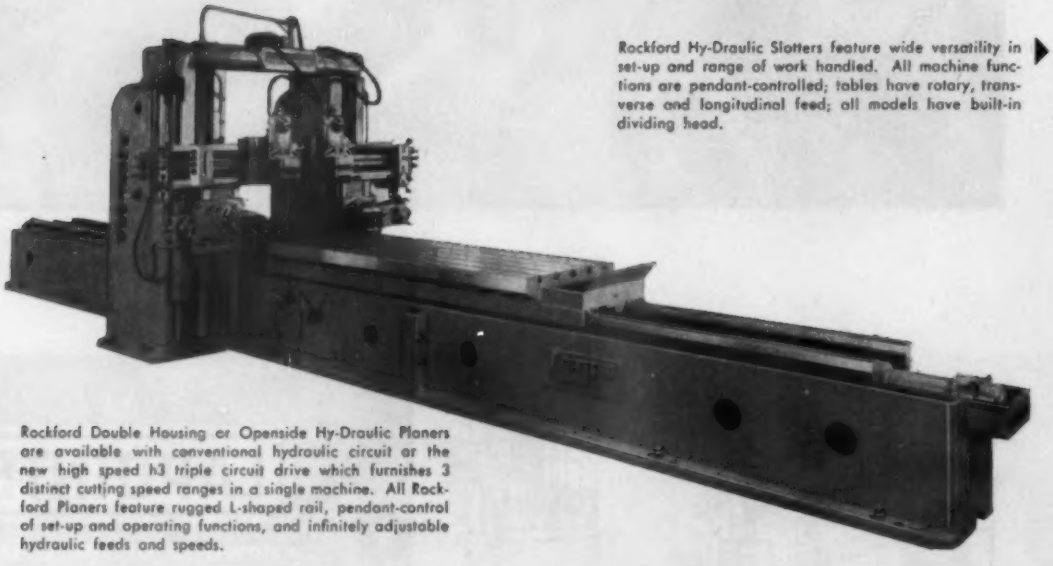
HIGH-SPEED, FAST REVERSALS

NATURAL CARBIDE TOOL CAPACITY



Rockford Hy-Draulic Openside Shapers provide speed, accuracy and flexibility of set-up for efficient production of small planing and large shaping work.

Rockford Hy-Draulic Slotters feature wide versatility in set-up and range of work handled. All machine functions are pendant-controlled; tables have rotary, transverse and longitudinal feed; all models have built-in dividing head.



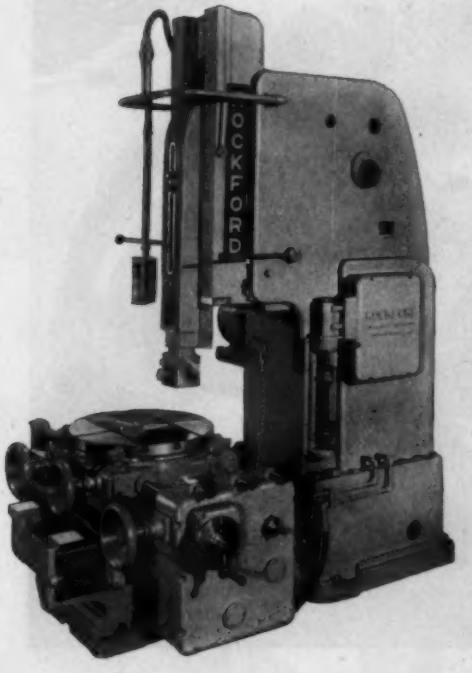
Rockford Double Housing or Openside Hy-Draulic Planers are available with conventional hydraulic circuit or the new high speed h3 triple circuit drive which furnishes 3 distinct cutting speed ranges in a single machine. All Rockford Planers feature rugged L-shaped rail, pendant-control of set-up and operating functions, and infinitely adjustable hydraulic feeds and speeds.

Hydraulic drive and feeds, as basic features of Rockford Hydraulic Machine Tools, provide outstanding performance measured in terms of work quality, high production and low operating cost. They also provide the cushioning action essential to the use of modern carbide tools.

do you get these advantages!

Today, countless metal-cutting operations are performed effortlessly, at low cost, and with high production rates on Rockford Hy-Draulic designed machines. Hydraulic control and power respond instantly so that inexperienced operators easily adapt infinite speeds and feeds to the most complex and accurate machining cuts.

Compare your present shaping, planing or slotting operations with these modern production features, and determine the savings available with Hy-Draulic flexibility. Our engineers will gladly furnish estimates for your particular requirements.



Rockford Hy-Draulic KOPY-KAT duplicator transfers single or 2-dimensional forms directly to the work on Rockford Hy-Draulic Shapers, Planers and Slotters. The hydraulic duplicator valve is so sensitive, so exact, that positive duplication of complex forms is completed with the ease of straight production machining.

RMT

ROCKFORD MACHINE TOOL CO.

2500 KISHWAUKEE STREET ROCKFORD, ILLINOIS

JONES & LAMSON TURRET LATHES

the man who needs a new machine tool is already paying for it

Single point threading to a finish of 15-20 RMS is completely automatic—and fast

The I. D. of these large cap-nuts is approximately 5¼". The material is High Chrome Nickel Steel, Rockwell C 30–32. The thread is 8 pitch, 5 ½" long, *and tapered .005" per inch.*

It's a tough job to make time on, but a J & L Turret Lathe equipped with an Auto-Threader, does the threading in 5 minutes!

Here's how: The part is faced and a rectifying bore is made; in the same chucking, threading is completed in 16 automatically-controlled passes, with a graduated cutting depth for each pass. *Pitch diameter is held to .002",* and finish is 15–20 RMS on the flanks.

On the old machine, milling the thread alone took 75 minutes. With this new setup, the entire operation — including loading, facing, boring, threading and unloading — is only 15 minutes.

Jones & Lamson Turret Lathes are available with: Completely automatic controls; 45°, 60°, and 180° Tracers; taper attachments, and a variety of other tooling complements, all designed to increase productivity.

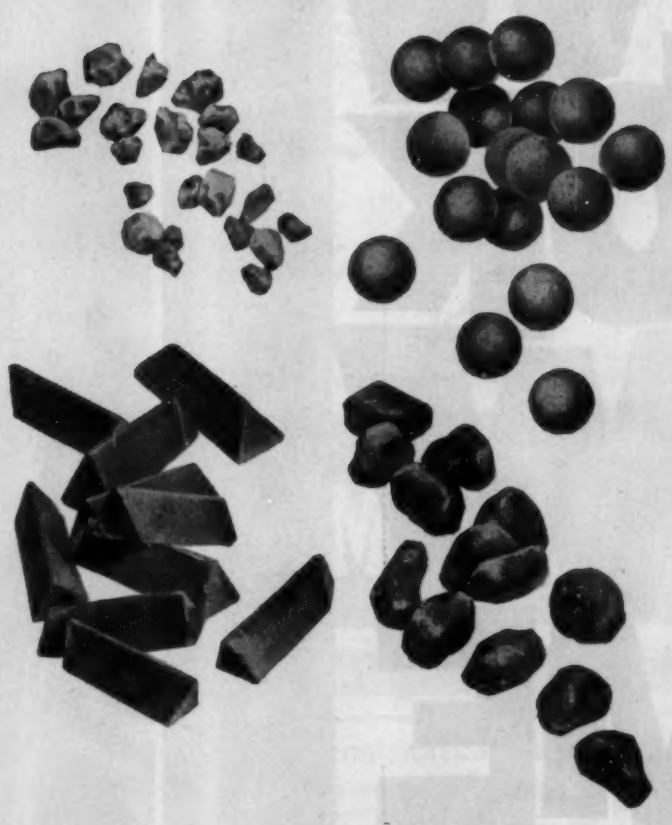
Write for detailed information, Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

Barrel Finishing is best finishing

. . . with TUMBLEX abrasives*

. . . and you get them fast, too



To give parts, ranging from tiny needles to hefty castings, a fine, uniform finish — and to save substantially on all your finishing jobs — make sure you:

Combine the right barrel finishing techniques with abrasives that perform best—and are delivered to you fast.

From Norton you can get the broadest range of top-performing barrel finishing abrasives. For quick shipments complete stocks of the following TUMBLEX abrasives are maintained at Worcester: random shaped "A" in 14 sizes . . . bonded "T" triangles in six sizes . . . bonded "S" spheres in five sizes . . . bonded "RP" round pins in two sizes . . . bonded "TP" triangular pins in one size . . . "N" natural stones in seven sizes.

You get further assurance of prompt deliveries to help you avoid production delays. Adequate stocks of the most popular TUMBLEX abrasives are kept at your nearest Norton branch warehouse or at your distributor's.

Send samples of your work to our Sample Processing Department. We'll barrel finish, return samples and report the methods and abrasives you need for better, lower cost finishing. NORTON COMPANY, General Offices, Worcester 6, Massachusetts. Plants and distributors around the world.

*Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

G-387

75 years of . . . **Making better products . . . to make your products better**

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — **BEAN-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

NEW PRODUCT
NEW LOOK
NEW NAME

CIRCLE 177 READER SERVICE CARD

KAISER ALUMINUM **MICRO-CHIP**
Alloy 2011-T3

OFFERS YOU **3** NEW ADVANTAGES:

1 **PROCESSED FOR EASIER MACHINING** • Micro-Chip is alloy 2011-T3 stock produced by a unique process that improves machinability—gives finer smaller chips. Speeds your production ...saves wear on your equipment.

2 **BOTH ENDS OF BAR CHAMFERRED (Most sizes)** • Now you can feed either end of the bar into the machine! Eliminates extra handling and awkward flip-flopping, and reduces feed finger wear. Micro-Chip comes in 12-foot lengths, up to 3-inch diameter and 2-inch hex in standard 200-pound packages.

3 **NEW BRIGHTER, CLEANER SURFACE** • Automatically gives the parts you produce an improved finish in areas where no stock is removed. Permits cleaner handling in your shop...saves you finishing time and work...may allow you to make lower bids.

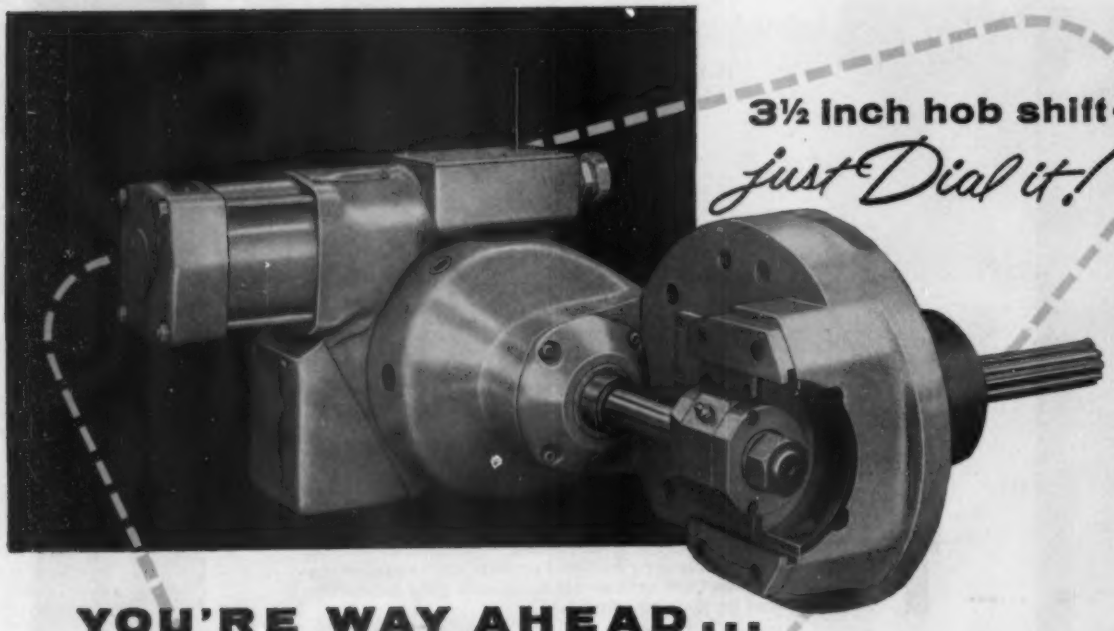
THIS LABEL IDENTIFIES MICRO-CHIP

Kaiser Aluminum Micro-Chip is now available through Kaiser Aluminum and Kaiser Aluminum Distributors – **at no increase in price** over regular 2011-T3 screw machine stock. Ask for it by name and look for this label.

Kaiser Aluminum & Chemical Sales, Inc., 300 Lakeside Drive, Oakland 12, California

See "MAVERICK" • Sunday Evenings, ABC-TV Network • Consult your local TV listing.

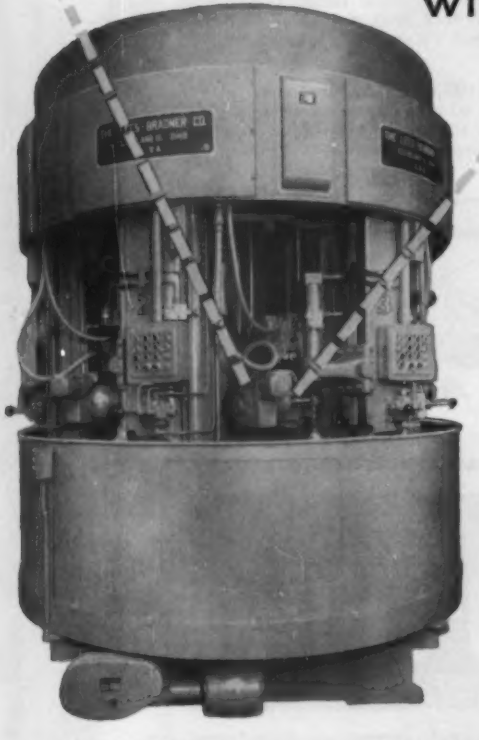
CIRCLE 178 READER SERVICE CARD



3½ inch hob shift—
just Dial it!

YOU'RE WAY AHEAD...

with THIS HOB HEAD



...another FIRST from LEES-BRADNER!

Your business is to make money.

Our business is to help increase your production and lower your costs so you can make money!

The super-efficient hob head of the Lees-Bradner 7-HD line of modern hobbing machines makes them the most versatile, fast and accurate machines for gear cutting industry has ever known.

Put teeth in your future money-making, time-saving production plans! Step up to Lees-Bradner and cut down your gear hobbing costs.

Right now send for your 7-HD brochure and get the complete money-saving facts about the 7-HD hobbing machines—in single, 4 and 6-spindle models.

LEES-BRADNER
7-HD 6-spindle hobbing machine
(Hard-Duty)

IMPROVING GEARS... FOR 50 YEARS!

the LEES-BRADNER Company
CLEVELAND 11, OHIO, U.S.A.

WHICH IS MOST IMPORTANT TO YOU?

Power
Speed
Versatility
Capacity
Quick Setup?

Gisholt No. 12 Automatic Chucking Lathe

You don't have to sacrifice one advantage for another because here is an ideal combination of all in the industry's most modern high-production automatic chucking lathe.

This Gisholt No. 12 is quickly set up to save you time and money on continuous, high-speed production or a wide variety of parts in small lots. It can take practically any part up to 16½" in diameter.

COST-CUTTING VERSATILITY. With 420 spindle speeds ranging from 40 to 2600 r.p.m. and an infinite selection of feeds, it gives you top efficiency in all phases of every job—cutting costs all the way.

INCREASES OPERATOR PRODUCTIVITY. Each machining step is handled in rapid automatic sequence—freeing your operator to handle additional machines.

GREATER POWER, GREATER ACCURACY. Constant h.p. motor (up to 40 h.p.) on the No. 12 takes full advantage of today's most advanced cutting tools and tooling techniques. Greater weight and rigidity allow heaviest cuts at punishing speeds without vibration.

COMPLETE RANGE OF ACCESSORIES. Front, rear, auxiliary and overhead slides can be used; angular cuts are easily made; JETracers can be used with greatest efficiency. Automation can be incorporated—from simple loading and unloading to gaging and sorting of finished pieces.

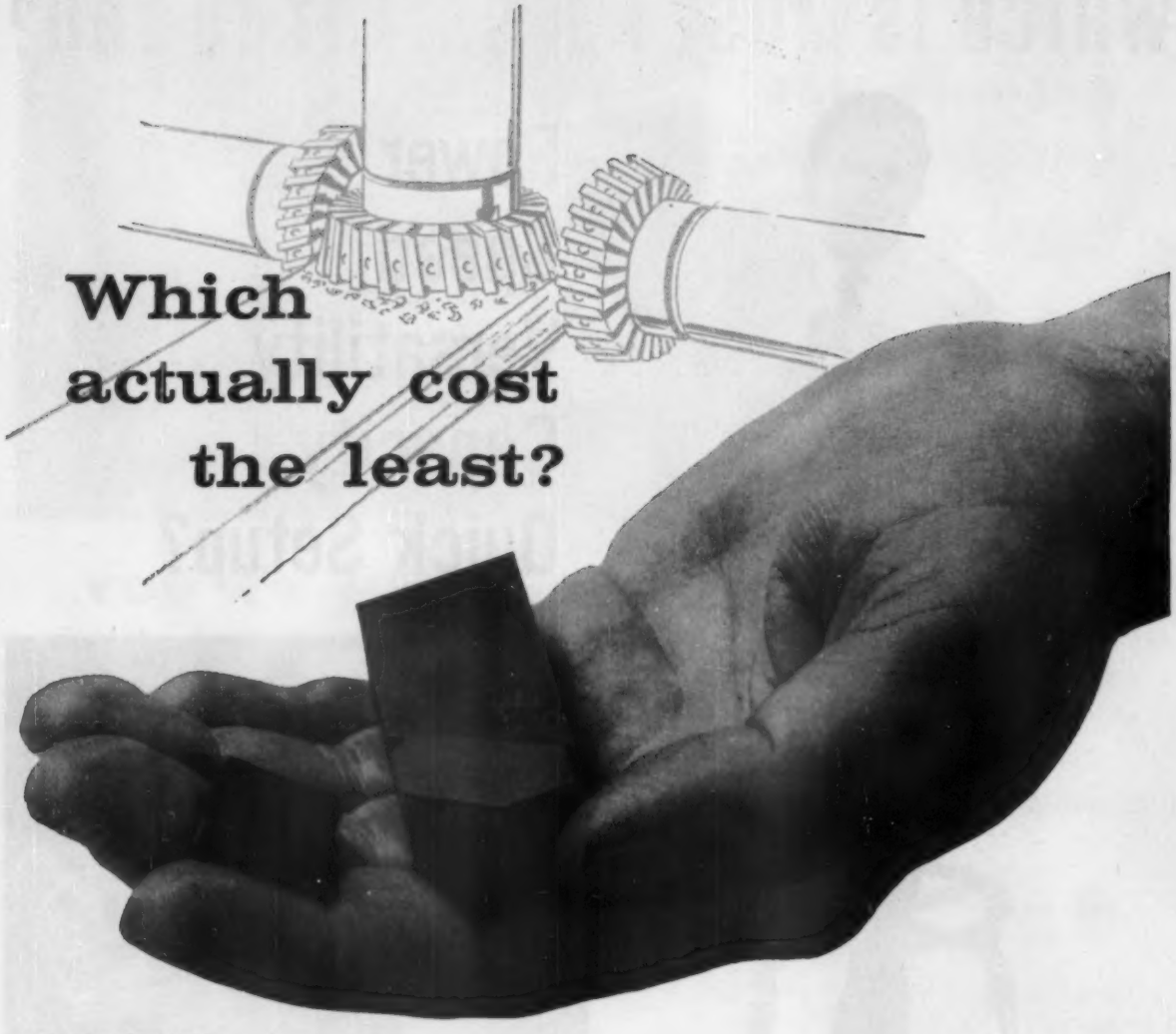
Your Gisholt Representative will gladly show you how the No. 12 Automatic Chucking Lathe will pay for itself in your plant. Call him, or write for Bulletin 1213.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Machines • Factory-Rebuilt Machines with New Machine Guarantee



Which actually cost the least?

LOOK TO INGERSOLL FOR THE ANSWER

There's a place for each. Some say the throw-away offers the lowest-cost edge. Others prefer the tipped blade for the same reason. Both are in general use.

Analysis of work to be done, of the machine assigned to the job, and of the cutter itself will determine what blade is best. That's why many firms rely on Ingersoll's help in arriving at economical solutions to cutter problems.

For efficient, low-cost metal removal, let an Ingersoll representative make a preliminary survey. It will cost you nothing . . . may lead to important savings. Ask a representative to call, or write for the booklet, "Ways to Reduce the Cost of Chips." Address Dept. K-68.

THE **INGERSOLL**
MILLING MACHINE COMPANY **CUTTER DIVISION** ROCKFORD, ILLINOIS

CIRCLE 181 READER SERVICE CARD

CIRCLE 182 READER SERVICE CARD ►

LINE BORING

STUB BORING

COUNTERBORING

ANGULAR BORING

FACE MILLING

END MILLING

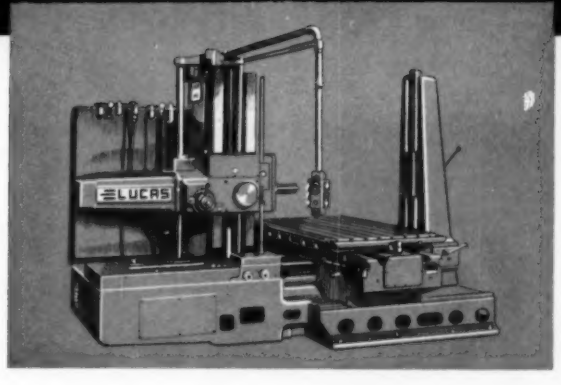
ANGULAR MILLING

DRILLING

REAMING

TAPPING

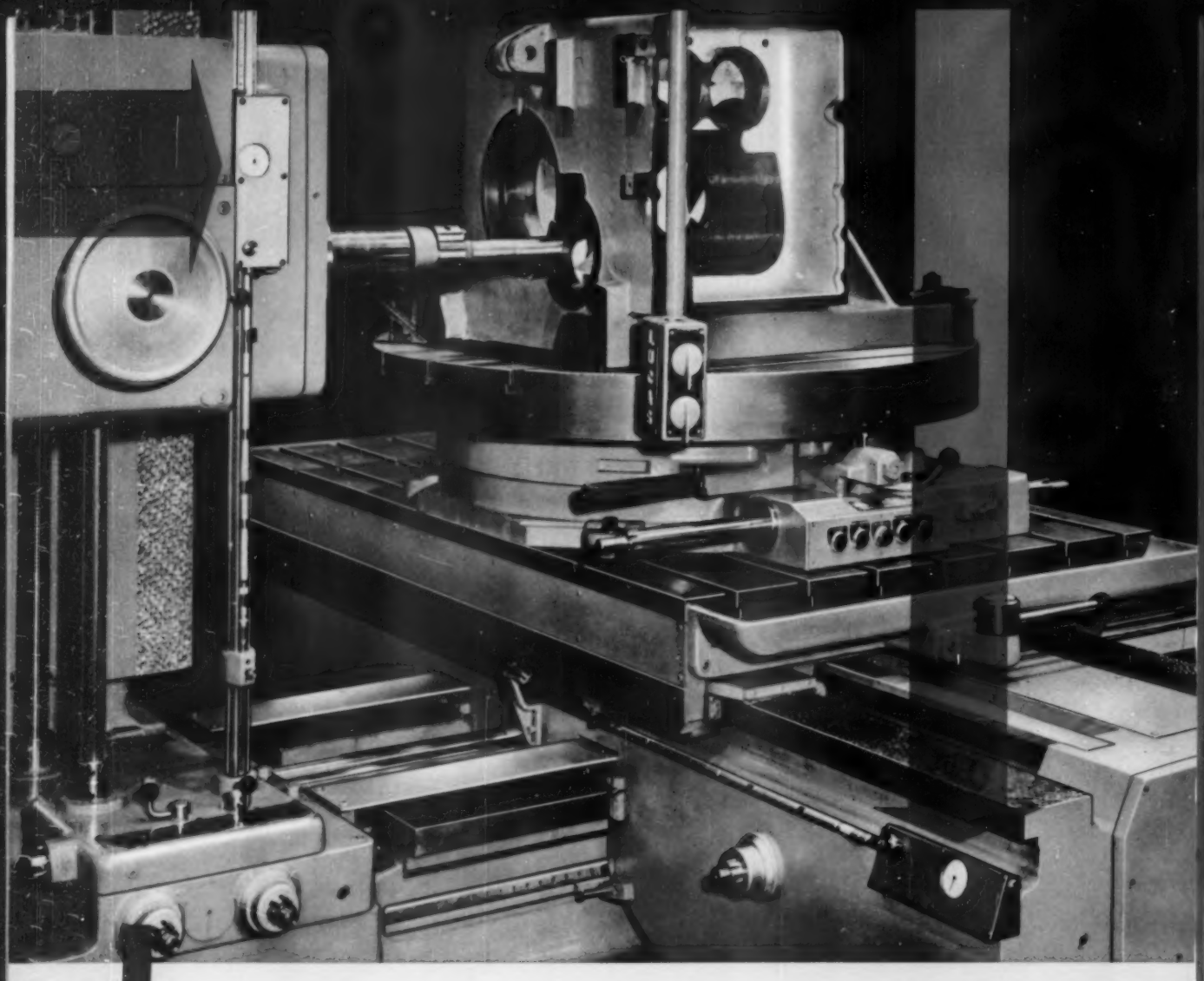
THREADING



Automatic power positioning with Lucas precision

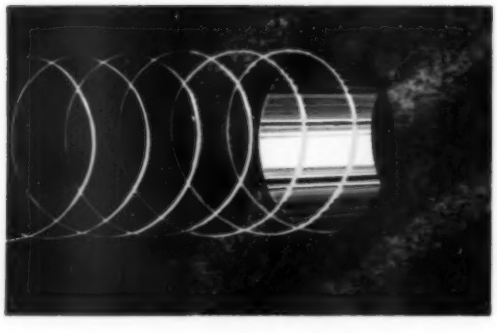
For production or faster completion of a single piece: locates head and table to predetermined settings for boring operations. No time wasted on jigs or fixtures in drilling, reaming and tapping. Lucas versatility, precision and time saving are the keys to Lucas profitability. Lucas Machine Division, The New Britain Machine Company, Cleveland, Ohio.

LUCAS
OF CLEVELAND

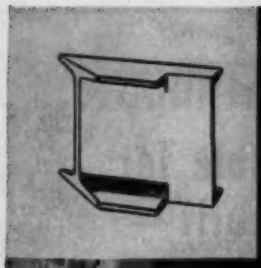


Automatic repeat settings accurate to ± .0001

Lucas Automatic Power Positioning operates at rapid traverse to locate head and table, entirely independent of operating feed rates—thru a system of end measuring rods and micrometer dial indicators. Upon starting the positioning cycle the machine does the precision setting automatically. Would you like a complete Lucas Catalog? Lucas Machine Division, The New Britain Machine Company, Cleveland, Ohio.



LUCAS
OF CLEVELAND



COPING AND MITERING HEAVY STRUCTURAL SHAPE

18" Beam (above) is held between vises for the short cut. On the long cut (left) vises were removed and beam held by simple clamp. The MARVEL Band Saw is truly indispensable in ornamental and structural iron shops where this type of work is done daily. The machine will cut-off square, miter and cope any work shape from the smallest moulding to 18" I-beams.

SPLITTING CLAMP RINGS, BUSHINGS

Splitting clamp rings, connecting rods, bushings and collets is a fast, simple operation on the No. 8 Band Saw. Perfect control, quick chucking facilities, accuracy and speed are features that especially fit the machine to handle this type of work.

MITERING LARGE DIAMETER PIPE

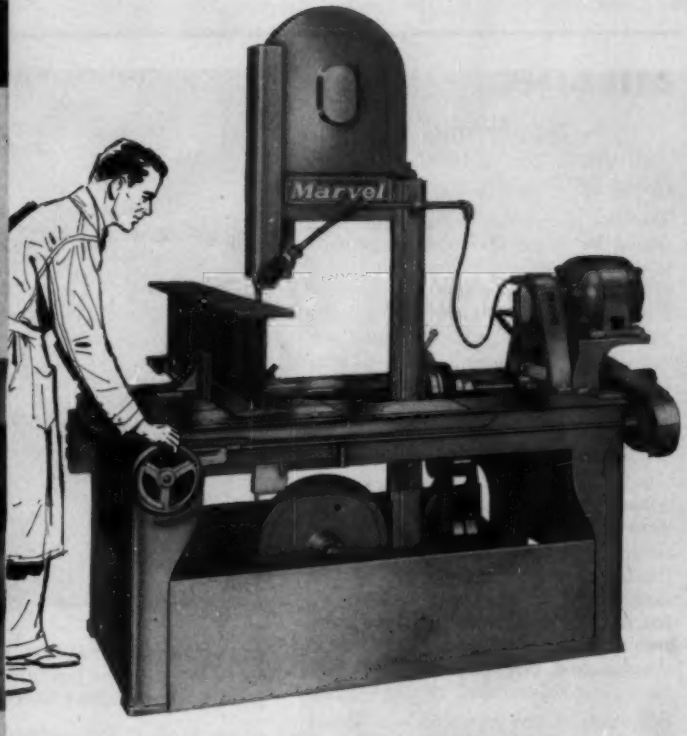
Pipe (or any bar shape) may be mitered at a 45° angle without the need for special jigs or fixtures. Even when cutting miters, work remains in the same position as it does for straight cuts. Column and blade are instantly tilted to desired angle, even without stopping the machine. Perfect miters (or lesser angles) are sawed without any layout or special equipment.

SEGMENTING LARGE DIE BLOCK

Three equally spaced re-entrant cuts were made in this 16" x 18" SAE 4130 Forging. Job was completed, floor-to-floor in 5 hours. No special jigs or fixtures were required. An unusual job that serves to emphasize the versatility of the MARVEL No. 8 Saw.

MMT=PE

"The One Machine We Couldn't Do Without"



"As simple to use and handy as a Scout Knife" is the way another user described his MARVEL No. 8 Universal Band Saw recently . . . and we can't think of a better way to describe this versatile metal cutting machine.

With a MARVEL No. 8 Band Saw, you can do almost any conceivable straight, angle, or miter metal sawing job—from cutting-off bar stock to making the most unusual forming cuts. You can handle small, delicate work, and in the next minute, saw structurals, or segment large work as illustrated in the lower photograph. You will save time, labor, and material with a MARVEL No. 8 Band Saw because no other saw has all the features to be had in this truly universal tool.

Upright column design and forward travel of the blade through the work (which remains stationary on the table-height saw bed) provides easy, unobstructed visibility and more convenient and efficient working conditions; column can be tilted and locked at any angle up to 45° left and right of vertical; the exclusive MARVEL Power Feed with Automatic Overload Relief; Automatic cutting-depth stops; simple, convenient operating controls—these are some of the features which make the No. 8 Band Saw the most useful—and used—metal cutting saw on the market.

For the complete story, ask or write for Bulletin 875 which illustrates and describes MARVEL Universal Metal Cutting Band Saws.

MARVEL Metal Cutting SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 W. BLOOMINGDALE AVE. • CHICAGO 39, ILL.

◄ CIRCLE 183 READER SERVICE CARD

CIRCLE 184 READER SERVICE CARD

SUNDSTRAND "Engineered Production" METHODS...

practical ideas for men who are responsible for manufacturing quality, quantity, and profit

MILLING

— Sundstrand Rigidmil combines two operations, returns 25% of its cost annually

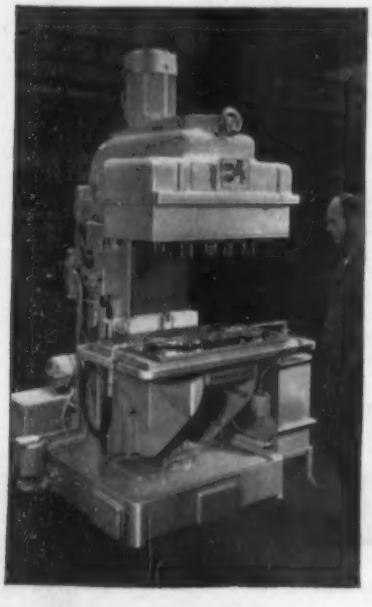
Turbine diaphragms formerly produced by a method requiring three machines now are turned out faster and better on a single Sundstrand Rigidmil with a vertical and a horizontal spindle. Two operations are required — machining of flat surfaces where the diaphragm halves are joined, and milling of special keyways, the latter performed by the vertical spindle of the Rigidmil.

The Sundstrand machine will return more than one-fourth of its cost annually by savings in direct labor, setup time, reworking, and hand finishing. Additionally, it releases floor space, will meet new demands for larger workpieces, and will permit better tool control. On some diaphragms, the new equipment will save four setups and 26 crane lifts.

Selection of the machine was based on the proved performance of similar Sundstrand machines in the field,

and on the fact that it could be built specifically for the job almost entirely from basic standard elements.

Wherever you have operations that might be performed or combined on a milling machine, a Sundstrand "Engineered Production" Analysis will help you establish the economic feasibility of a new machine. For more details on Sundstrand Rigidmils, ask for Bulletin M-113.



MULTIPLE-SPINDLE DRILLING

— new Sundstrand machine features low-cost precision heads which can be changed over in 15 to 20 minutes

Sundstrand multiple-spindle precision drilling, boring, reaming, and tapping machines embody a new concept which provides exceptional versatility and economy, particularly on nonferrous parts. The unique design of the heads eliminates all gearing and permits a complete change-over from one head to another in 15 to 20 minutes.

The moderate cost of the heads and the relatively low-cost spindles which can be used make the machines practical even for moderate production runs of a variety of parts. And, often a single head can be designed for machining two or more similar parts. In the event of a change-over in work handled, up to 75% of an obsolete head can be salvaged to make up a new one.

There is no sacrifice in precision. Tolerances to .0002″ for spatial relationship, shoulder depth, and hole size can be maintained by operators with ordinary skills — depending on size of part, shrinkage, expansion, material composition, tool maintenance, etc. Inspection requirements are greatly reduced because spatial accuracy is built into the head, fixtures, and machine itself.

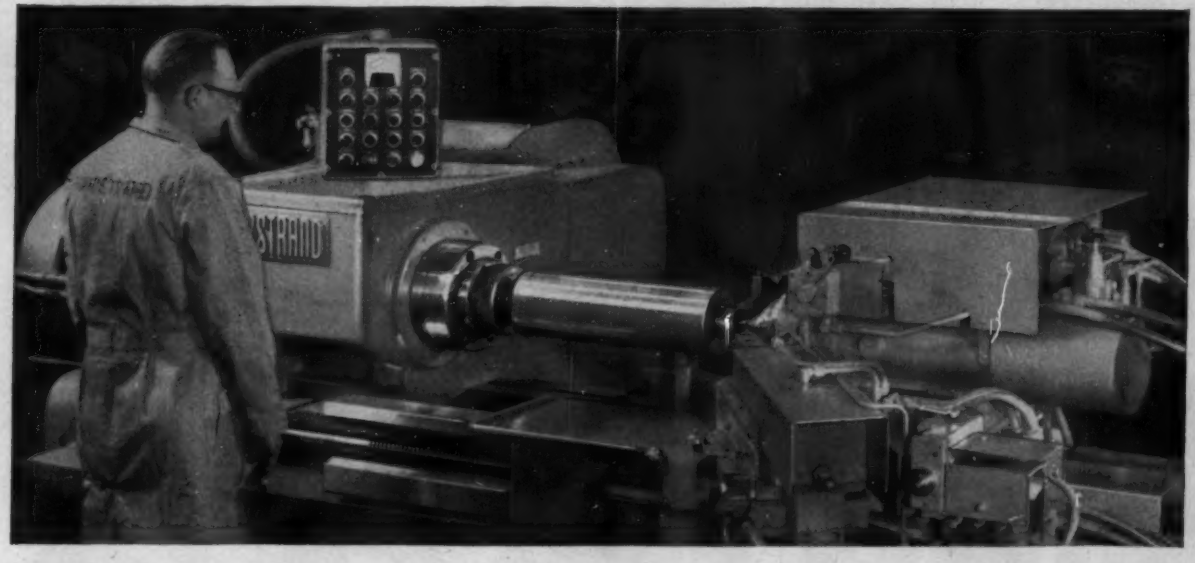
Even change-overs take no special operator skills because the head mates with the machine spindle with foolproof simplicity. The workholding fixture is positioned quickly and simply in relation to the workhead.

For complete information, ask for Bulletin No. D-113.

TRACER TURNING

— Sundstrand machine turns and faces parts in one-third the time of former method

This Sundstrand multi-cycle tracer lathe turns the outside diameter and faces shoulders of air compressor rotors three times as fast as equipment previously used. Ten different parts are produced in lot sizes averaging 20 pieces. Whether for short or long runs, you can expect comparable economies when you replace obsolete turning equipment and methods with modern Sundstrand automatic lathes. A Sundstrand "Engineered Production" Analysis will determine the machine and tooling that will provide you lowest possible manufacturing cost. For more details on Sundstrand Lathes ask for Bulletin T-113.

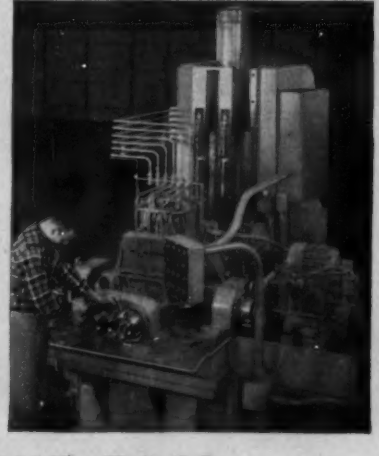


BROACHING AND MILLING

— one Sundstrand machine combines the two and cuts machining time 70%

A major opportunity for cost reduction in many shops lies in the use of multiple-operation machines. The part illustrated provides an excellent example. Formerly, the operations indicated required four machines. With the new Sundstrand machine which combines broaching and milling, parts are produced with 70% less machine time . . . reduced setup time . . . practically no rejects . . . less maintenance . . . less floor space . . . reduced operator fatigue . . . elimination of unbalanced inventory . . . better quality standards . . . less handling between machines.

If you want to explore the opportunities for profitable multiple-operation machining in your shop, ask for details about a Sundstrand "Engineered Production" Analysis.



SUNDSTRAND MACHINE TOOL

BELVIDERE, ILLINOIS

DIVISION OF SUNDSTRAND CORPORATION

CINCINNATI
CINCINNA

These CINCINNATI® Shears give

"A most outstanding performance"

"Any job put on our Cincinnati Shears is routine," says C. E. Ball, Assistant Sales Manager of The Hill-Chase Steel Co., big Baltimore warehouse. "They have accomplished a most outstanding performance."

Faced with customers' demands for increased accuracy in sheared sheet, plate, and strip, more and more warehouses are discovering the profits which Cincinnati Shears can bring them.

The fast and sure way to get accuracy in shearing, slitting, and notching is to specify the Cincinnati line. Our representatives will be happy to discuss your application with you.

Photo Courtesy of The Hill-Chase Steel Co.

Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio, U.S.A.

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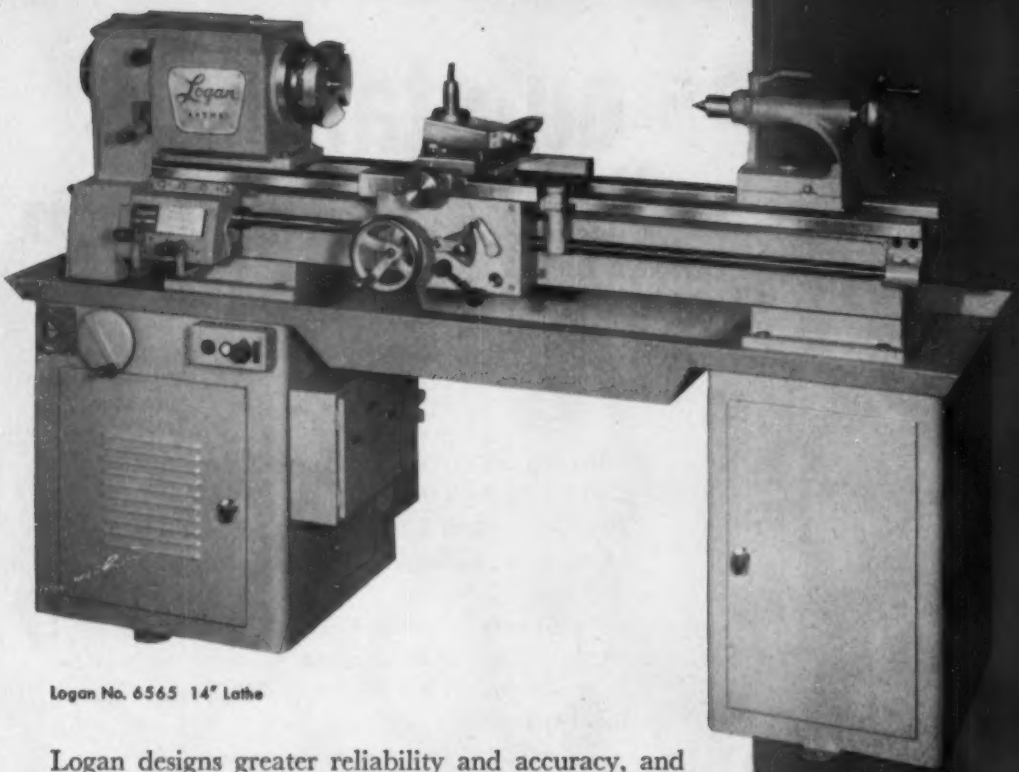
its specifications add up to high production capacity

Logan 14" Lathe



Logan No. 6565 14" Lathe

Logan designs greater reliability and accuracy, and longer life into its lathes by a generous combination of high-quality features. For instance—

- **An oversize spindle with 1⅝" bore turns on four super-precision ball bearings with built-in preload**
- **A variable-speed drive lets you change speed while work is turning—without shifting belts**
- **A warp-free lathe bed with high, strong walls braced by oversize ribs to withstand heaviest stresses; two V-ways and two flat ways are flame-hardened and precision-ground.**

There are many more reasons why this and other Logan Lathes have a greater capacity. The specifications tell the story. Write for literature and complete information.

- Spindle speeds to 2000 rpm.
- 1½" Levermatic collet chuck capacity
- 14⅝" swing over bed
- 9" swing over saddle cross slide
- 40" between centers

LOGAN ENGINEERING CO. Dept. G-360 4901 Lawrence Ave., Chicago 30, Ill.

A PRODUCT OF SKILL

the complete line Reamers are typical of Butterfield's long-life cutting tools. Also ready for fast delivery are: drills, taps, dies, counterbores, cutters, end mills, hobs and carbide tools. Phone for tools or technical assistance. Warehouses in Chicago, Detroit, Fort Worth, Los Angeles, New York and San Francisco. **Call your Butterfield Distributor.**

BUTTERFIELD

DIVISION, Union Twist Drill Company, Derby Line, Vt.

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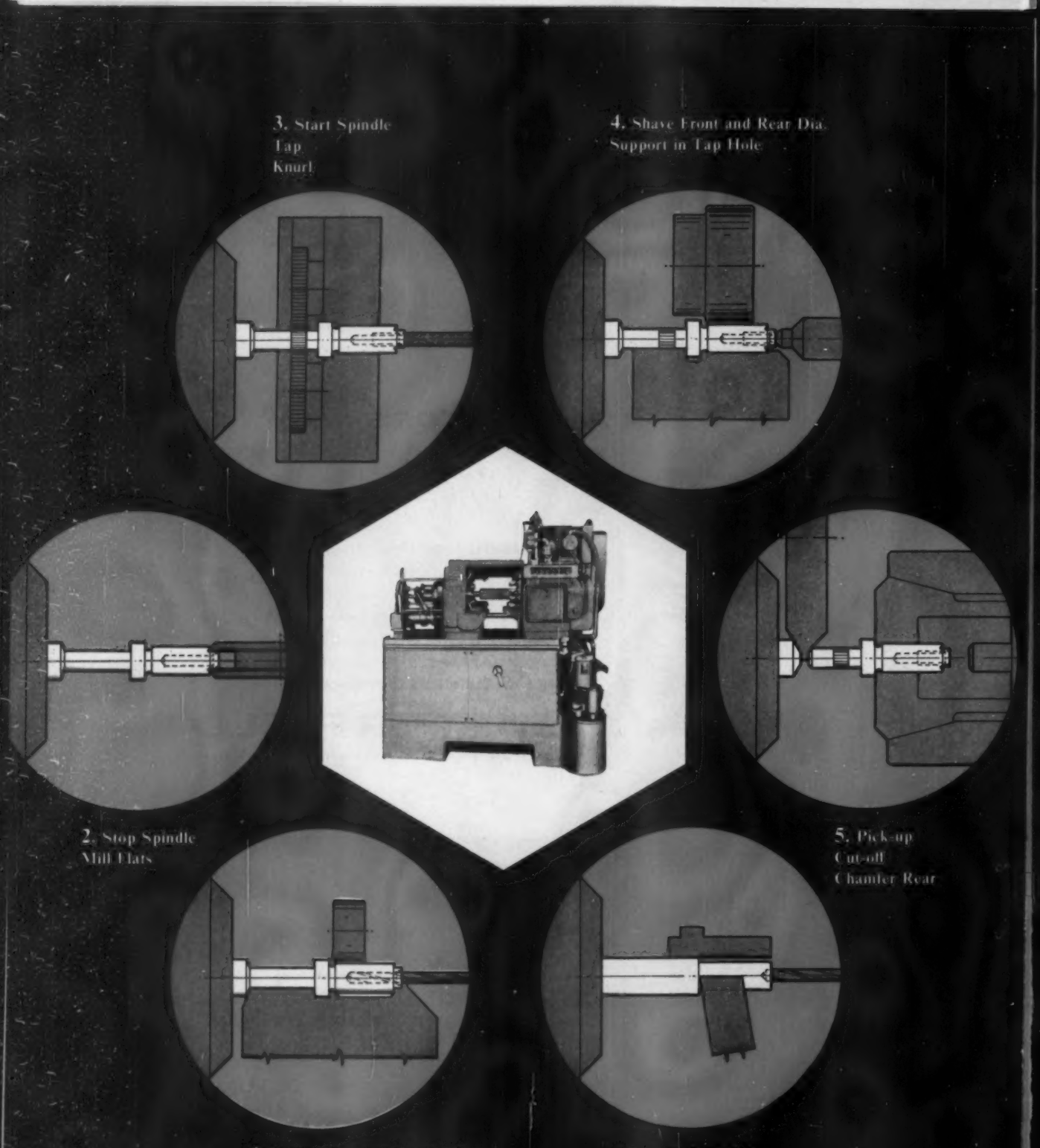
CIRCLE 191 READER SERVICE CARD ►



9 operations in 3.8 seconds . . . one of the typical parts produced by Keystone Mfg. Co. on the [illegible] RA-6 Bar Automatic

85,000 Pieces Per Day And No Rejects

Production *facts* tell a typically impressive story of Acme-Gridley machining efficiency at Keystone Manufacturing Company, Boston, Mass.

"We have five 7/16" RA-6 Spindle Bar Automatics", states a Keystone executive. "Everyday, they produce an average of 85,000 precision parts for our cameras and projectors . . . and yet, there are literally no rejects. As a result of this consistent conformance to our tough tolerances, scrap losses have been wiped out and inspection time reduced to an all time low. What's more, because Acme-Gridleys produce in a single set-up jobs otherwise requiring secondary machining, we've cut production costs."

Dramatic and *tangible* savings like those realized by Keystone are commonplace with Acme-Gridleys. Such features as a wide open tooling zone, direct camming and independently operated tool slides can help you achieve higher mass production efficiency at lower cost. We'll be happy to supply complete information on the world's most complete line of multiple and single-spindle automatic bar and chucking machines. Call, write or wire.

National Acme's "Zone of Responsibility" includes all phases of cost reduction

Check YOURS . . . Then Check National Acme

Direct Costs: these include direct dollar savings as realized by Keystone Manufacturing Co. . . . an "everyday" job for Acme-Gridleys. **Indirect Costs:** effecting important savings in maintenance, downtime, scrap reduction, tool costs, etc. **Product Redesign:** teaming with your design group to take full advantage of Acme-Gridleys' cost reducing capabilities. **Direct Material Costs:** our engineers provide important savings in this area by constantly matching machines and tools to modern metallurgical problems. **Make-or-Buy Reviews:** in many cases our Contract Division can assume your production headaches and relieve you of immediate capital investment. **Spot Modernization:** pioneering in modern tooling methods, and the flexibility of Acme-Gridleys can provide many "on-the-spot" savings.

National Acme

The National Acme Company
171 E. 131st Street
Cleveland 8, Ohio

Sales Offices: Newark 2, N.J.; Chicago 6, Ill.; Detroit 27, Mich.

MMT-PE

CIRCLE 192 READER SERVICE CARD

CARMET® INDEXABLE CARBIDE INSERTS

the magic that cuts machining costs!

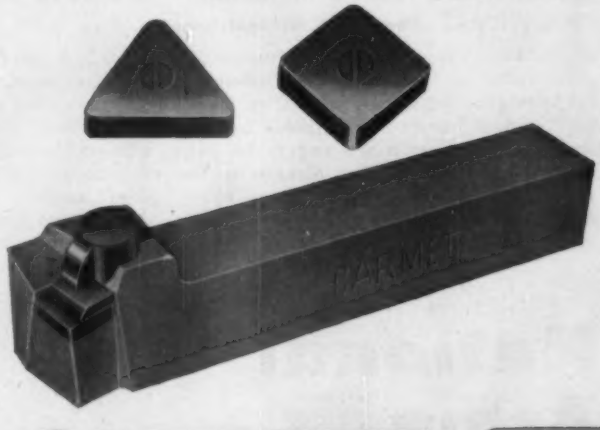
784
New, sharp cutting edges from 98 Carmet Indexable Square carbide inserts at 10¢ that will do almost every cutting job
Approx. $78.40

784
Individual brazed single point tools at a cost of $3.50 each
Approx. $2,734.00

These savings point the way to finding out more about Carmet Indexable Inserts and the complete line of Carmet cemented carbide tools and standard blanks to cut your machining costs so deep—it's like magic!

Your Carmet distributor carries a full range in stock and assures prompt delivery. He will help you in selecting costs. Call him today, or write Allegheny Ludlum Steel Corporation, Carmet Division, Detroit 20, Michigan.

Over 118 styles and sizes of Indexable Inserts to use in Carmet high-alloy cadmium plated Tool Holders in both positive or negative rake types.



Write for New-Revised CATALOG C-16-8
CARMET CEMENTED CARBIDES FOR INDUSTRY

This 32-page book contains revised prices and complete specifications on Carmet's full line of cemented carbide tipped tools, blanks and holders. Speed and feed charts, grade comparisons and ordering information included.

ADDRESS DEPT. AM-27

149

CARMET

CEMENTED CARBIDE DIVISION OF
ALLEGHENY LUDLUM STEEL CORPORATION

THE BELLOWS AIR MOTOR®

THE ONLY AIR CYLINDER WITH A CHOICE OF BUILT-IN VALVES

In designing for air operation, the engineer can choose the method of valving he prefers—and still have all the advantages of integral valve and cylinder construction.

Six different built-in valve arrangements give the engineer every latitude in pneumatic design.

If he prefers to use 8-12 volt electrical control with its simplified wiring, Bellows has it. If he prefers to use 115 volt control and JIC standards, Bellows has it. If he requires low or high voltage explosion-proof control, Bellows has it. Should his design require full pneumatic control, Bellows has it. Or should he wish to control his pneumatic circuits manually or through mechanical linkage or cams, Bellows has it.

Unlike conventional air cylinders which require separate remote directional and speed control valves and dual piping, the Bellows Air Motor is a complete power unit with directional valve and dual speed control valves built-in as an integral part of the unit. Only one air connection, which can be made with flexible hose, is required.

Integral valve and cylinder construction means quick response, more positive response, more precise control and more economical operation.

The Bellows Air Motor is made in five bore sizes: 1¼", 1¾", 2½", 3⅝", and 4½", and in any stroke length.

***WRITE FOR THIS BULLETIN* TODAY!**

Four-color, 20-page bulletin describes the complete line of Bellows Air Motors. Free on request. Address Dept. AM-360, The Bellows Co., Akron 9, Ohio.

827-C

The Bellows Co.

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

AKRON 9, OHIO

Announcing

an important new development for quality control measurement

AMES MODEL AG7

Accu-Flow* Air Gage Recorder

A permanent record of continuous measurements can be made in magnifications of 1750 to 1—3500 to 1—and 17,500 to 1.

Measurements are recorded by a "hot needle" on 2"-wide chart paper. The width of the paper may be made to equal measurements as small as a tenth of one-thousandth or as wide as four-thousandths. This allows the reproduction of minimum graduations representing two millionths or twenty millionths of an inch.

The AG7 provides a completely impersonal measurement record that can be used both as a controlling device and as a means of furnishing visible "proof of precision" to buyers of the measured products. Send for free ACCU-FLOW FOLDER.

*Trademark of B. C. Ames Co.

Booth 714
ASTE Tool Show
Detroit, April 21-28

Representatives in Principal Cities

B.C. AMES CO. *26 Ames Street, Waltham 54, Mass.*

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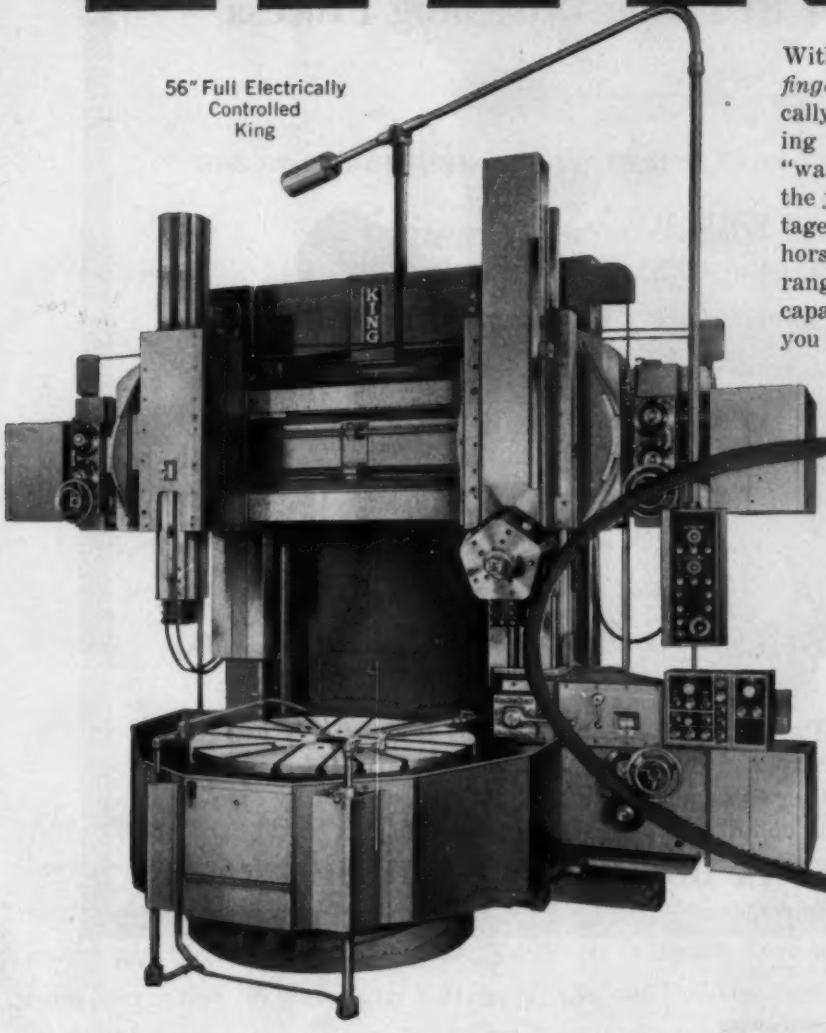
MANUFACTURERS OF MICROMETER DIAL INDICATORS AND GAGES

You spend more time Actually Cutting Metal

WITH THE NEW **FULL ELECTRICALLY CONTROLLED**

KING



56" Full Electrically Controlled King

With all controls literally *at the operator's fingertips*, these new KING® Full Electrically Controlled Vertical Boring & Turning Machines eliminate costly operator "waste-motion" in setting up and running the job. Add to this King's design advantages of increased machine rigidity, higher horsepowers, expanded speed and feed ranges—giving you full advantage of the capabilities of modern cutting tools—and you have

the greatest productive capacity ever achieved for your vertical boring and turning work.

Here's what FULL ELECTRICAL CONTROL gives you—

Direction of Head Movements by simplified "up-down" and "in-out" switches right on the pendant

Pushbutton control of feed and rapid traverse of heads, and of rail raising and lowering

Pre-selective feed and speed selector dials, permitting operator to set the next feed or speed while a cut is being taken

24 feeds from .0016" to .250" and 24 spindle speeds

AND

Still MORE "Automation" is available with these optional added features—

Automatic Feed Stops..."Ultra-Matic"® Programming ...Automatic Tracing Control of Heads... Power Indexing of Turrets

AMERICAN STEEL FOUNDRIES, KING MACHINE TOOL DIVISION
1150 TENNESSEE AVENUE, CINCINNATI 29, OHIO

MMT-PE

KING Vertical Boring and Turning Machines

CIRCLE 196 READER SERVICE CARD

From ROUGH BLANK to FINISHED GEAR *In 5 Seconds*

How? a New Red Ring Broaching Process

ACCURACY:

Pin size to .0009″

Lead to .0008″

Involute error .0003″

Composite error less than .001″

FLOOR–FLOOR: 15 Seconds

CHARACTERISTICS: 87 teeth, 24 pitch, 22° helix, 4″ O.D., ¾″ face—cast iron.

TOOL LIFE: After broaching 26,000 parts, this broach was resharpened by the removal of only .010″ of metal. In other cases, production would be governed by operating conditions.

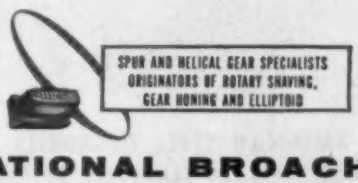
REPLACES SIX HOBBING MACHINES

8168

The above are actual production figures showing the possibilities of this amazingly effective broaching process.

The consistent precision and speed attained do not depend on the operator. They are engineered into the tooling.

Investigate the savings of this process as applied to your operations. Get the whole story from a Red Ring engineer.



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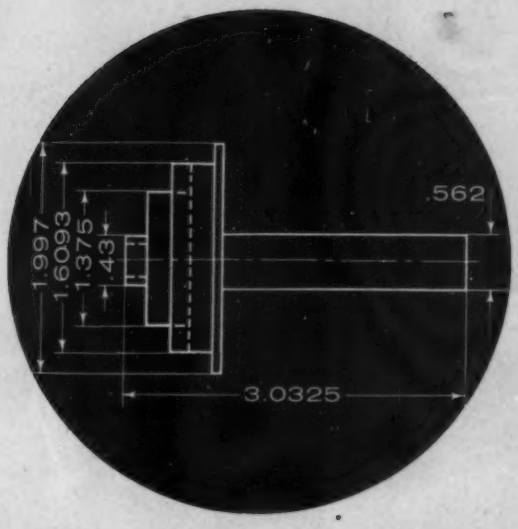
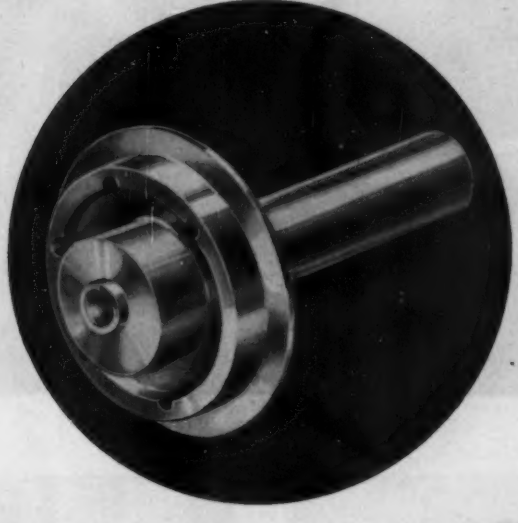
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



the shortest distance between these two points...

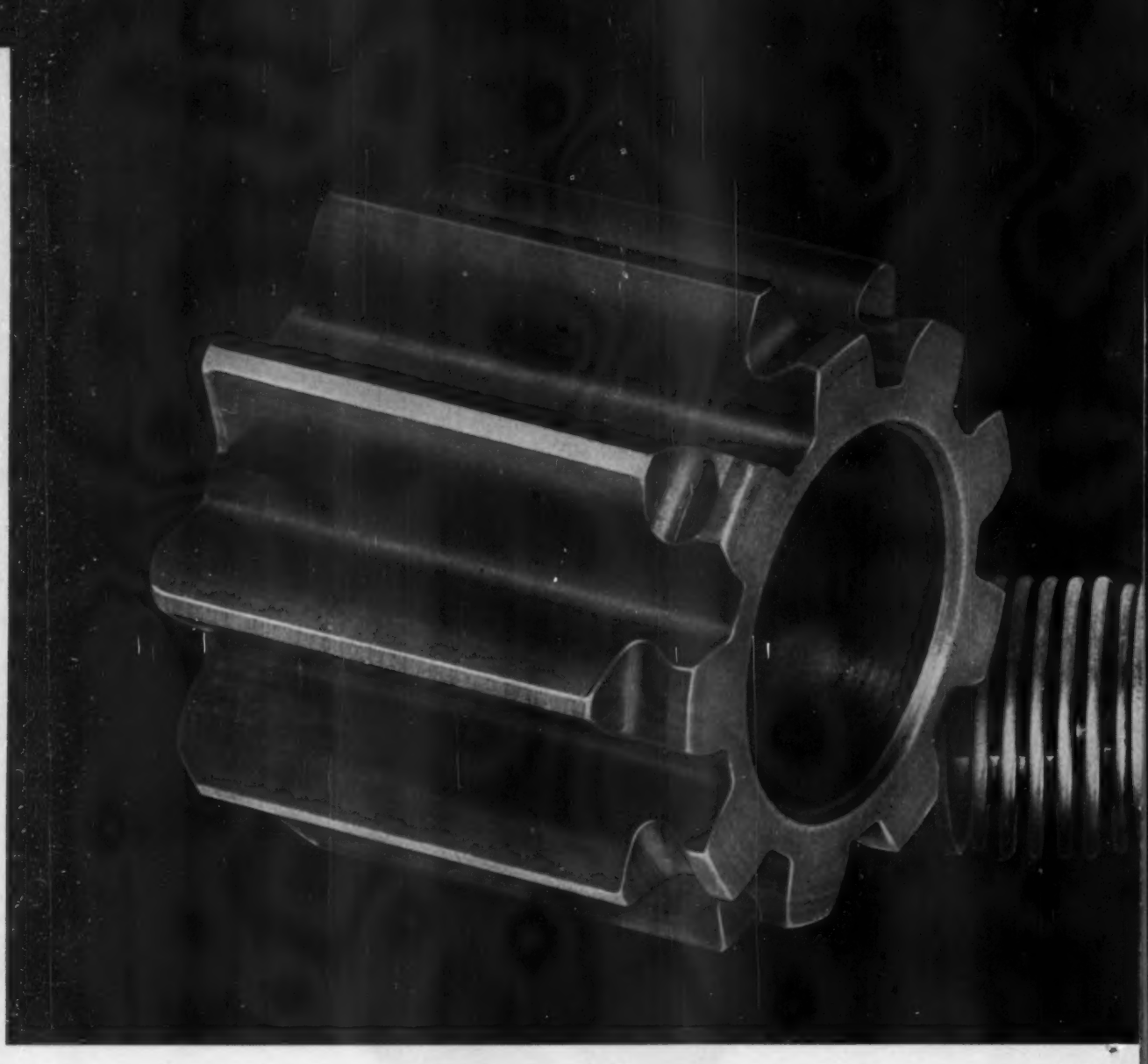
Carpenter stainless steel



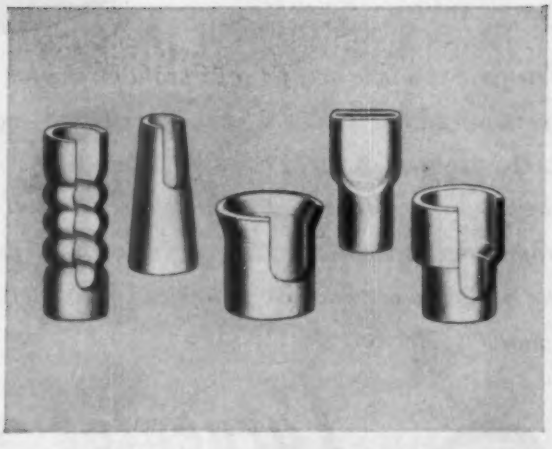
The time you save may be your profit on the job—especially when the job is an intricate machining operation on stainless steel parts. You can fully expect to save more time on stainless machining when Carpenter steel is used, because Carpenter has developed special grades that surpass any others in machinability. More than faster speeds, Carpenter customers have also come to depend (and profit) from longer tool life and better surfaces. If you don't believe that Carpenter stainless can surpass the steels you are now using, prove it to yourself on your next production run. The Carpenter Steel Company, Reading, Pa.

Carpenter steel

The Carpenter Steel Company, Main Office and Mills, Reading, Pa.
Alloy Tube Division, Union, N. J.
Webb Wire Division, New Brunswick, N. J.
Carpenter Steel of New England, Inc., Bridgeport, Conn.



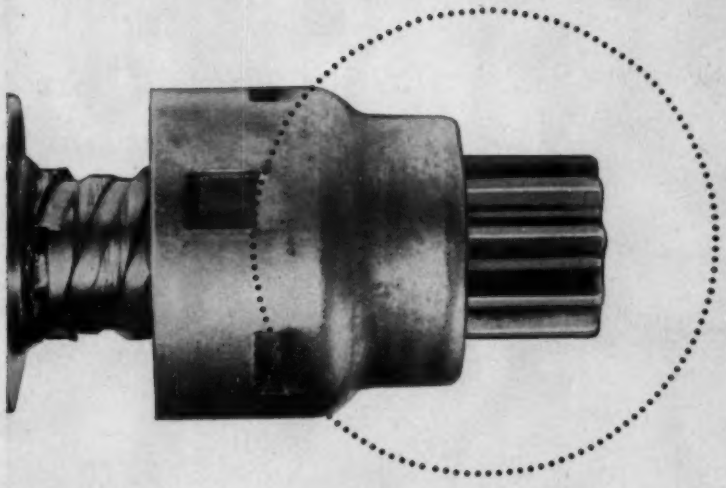
ONE-PIECE SHAPES REPLACE COSTLY ASSEMBLIES when Republic Cold Drawn Special Section Bars formed to the predominating cross section of the part are used. Completed parts are stronger, longer wearing, and cost less. Republic Special Sections simplify built-up, interlocking, or associated parts . . . are available in carbon, alloy, and stainless steels.



SIMPLIFIED TUBULAR PARTS PRODUCTION results from use of Republic ELECTRUNITE® Mechanical Tubing. With uniform wall thickness, concentricity, strength, and ductility, ELECTRUNITE Round Mechanical Tubing is easily flanged, swaged, flattened, spun, fluted, configured, rolled, upset, and otherwise changed in cross section. Mail coupon.

CIRCLE 199 READER SERVICE CARD

SOLVING THE PROBLEM



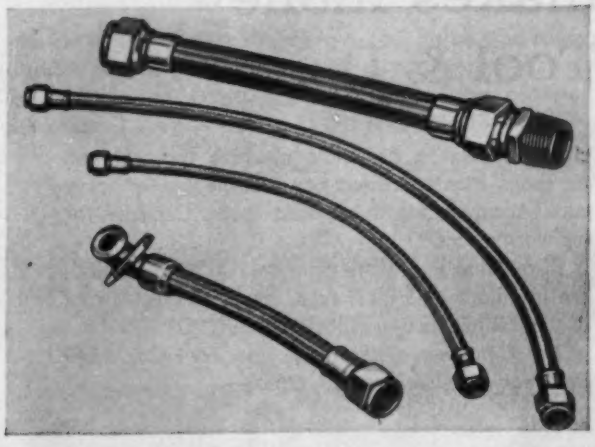
Alloy steel starter drive pinion withstands severe torque, impact, wear

One of the largest manufacturers of automobile starter drives specifies Republic Cold Drawn Alloy Steel Bars for their most critical component—the drive pinion.

Following delivery, the cold finished alloy bars are blanked, hobbed, chamfered, and drilled. Teeth are cut on a gear hobber, then pointed for easy meshing with the flywheel.

Use of Republic Alloy Steel provides the necessary strength and toughness to withstand torque, impact, and prolonged wear. In addition, the cold drawn alloy used provides better machinability at reasonable cost.

Republic field metallurgists will work closely with your metallurgists and engineers. 3-Dimensional Metallurgical Teams, comprised of field, mill, and laboratory metallurgists, will help you select, apply, and process the right alloy steel for any application. Write today or mail the coupon for complete information—without obligation—on this confidential service.



HIGH PRESSURE FITTINGS—sockets, nipples, flanges, elbows, and swivel nuts—to handle missile and aircraft fuels are produced by Resistoflex Corporation, Roseland, New Jersey. Fittings are machined from 3/8" and 2" diameter Republic Stainless Steel Bars to assure maximum strength, corrosion-resistance, and machinability.

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CIRCLE 200 READER SERVICE CARD

courtesy Ready Machine Tool & Die Co., Inc.

Gilbert boring mill makes money for Ready Machine Tool & Die

"This 5" Cincinnati Gilbert boring mill is already making money for us, and that's why we bought it," says C. P. Ready, President of Ready Machine Tool & Die Co., Inc., Connersville, Ind.

"For instance, with its precision positioning system, we can lay out holes directly from a print. This saves all the time we used to take to make and use templates."

And there are other things that make this Cincinnati Gilbert a profitable machine for tool and die shops. Plenty of direct power at the tool for heavy cuts. Accuracy for the tightest specs. Capacity for big work pieces.

Installed in the Ready plant are two of these modern machines; one table type, one floor type—proof of their confidence in Gilberts.

The Cincinnati Gilbert Machine Tool Co., 3340 Beekman St., Cincinnati 23, Ohio.

Write for new catalog

GILBERT

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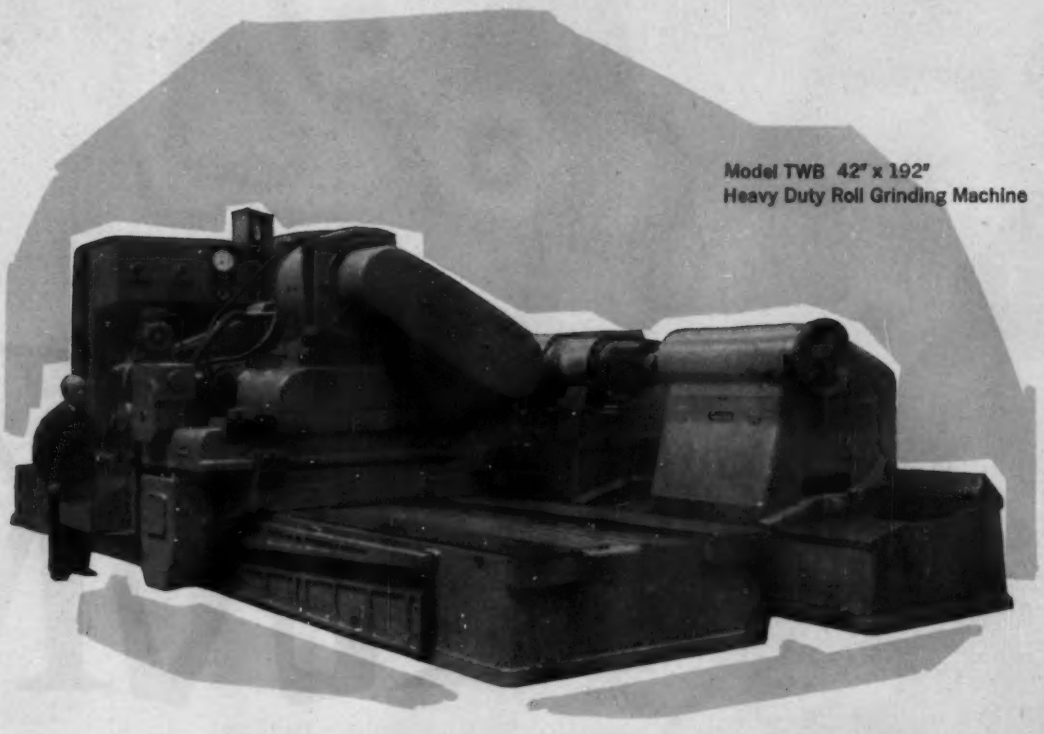

Model TWB 42" x 192"
Heavy Duty Roll Grinding Machine

LAPOINTE CHURCHILL

Precision Grinding Machines
Available up to 72" x 432"

A full range of PRECISION GRINDING MACHINES is now offered, in sizes all the way from toolroom type up to the very largest heavy duty roll grinding machines *36 feet between centers,* with the patented automatic electronic feed mechanism.

All are engineered for simplicity of operation, and ruggedly built with utmost care to perform the most exacting grinding operations. It can honestly be stated that no finer quality can be obtained than is built into these Lapointe Churchill Grinding Machines.

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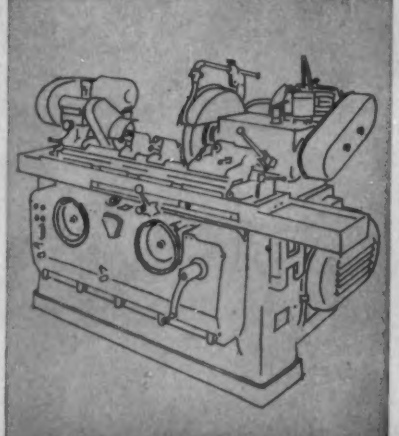
Model AW, 6" x 18"
Plain Cylindrical Grinding Machine



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HUDSON, MASSACHUSETTS

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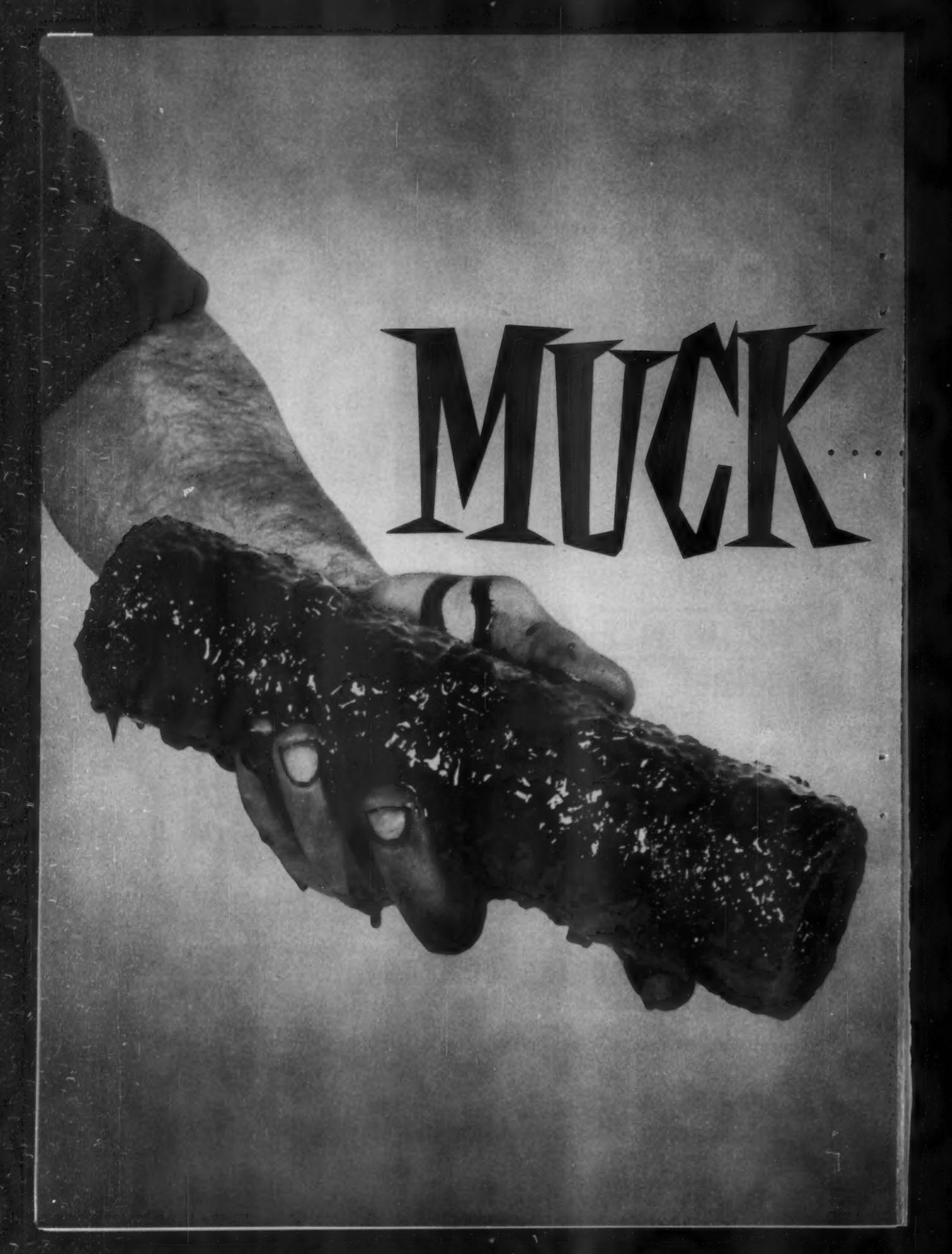
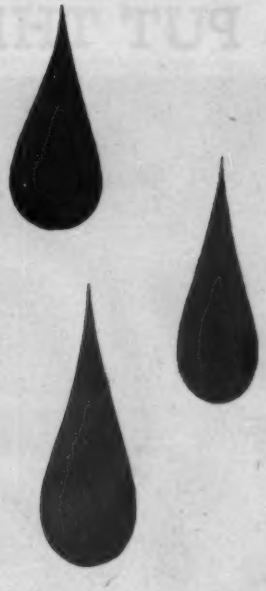

MUCK.....



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MORSE HELPS PUT THE MIGHT IN MACK

Longer lasting, faster cutting Morse tools give Mack smoother holes... increased production... long-range economy.

To build the toughest trucks on the road, Mack tooled up with the toughest tools on the market... Morse.

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Tough Morse cutting tools will add long-range economy... and improved performance... to your job, too. For details, contact your Morse-Franchised Distributor *today*.

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means "THE MOST" *in Cutting Tools*

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Morse means more production... smoother, more accurate production... with every type of cutting tool from drills, reamers, taps and dies, to end mills, milling cutters, slitting saws and "specials". So, if you want the best from every cutting tool you buy, mark your order "MORSE". For if you want *Morse Quality*, there's only one way to get it... *specify Morse.*

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"Rust Completely Under Control!"

CIMPLUS, rust-control specialist of the famous CIMCOOL family of cutting fluids, cuts special handling costs by more than $90 a week. (Company name on request).

2
SALES REPORT
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They were experiencing (1) Considerable rancidity... (2) Unsatisfactory settling of grit and sludge...(3) Parts were rusting so badly that they needed special handling. They were dried in sawdust. Rust had to be sandblasted or worn off in tumbling machines.
We installed Cimplus at 1:75. Rancidity—Now no problem. Grit settling—Excellent. Rust—Completely under control, with no special handling needed. Cimplus is saving them better than $90 a week in labor costs alone!
George Stoskuvee
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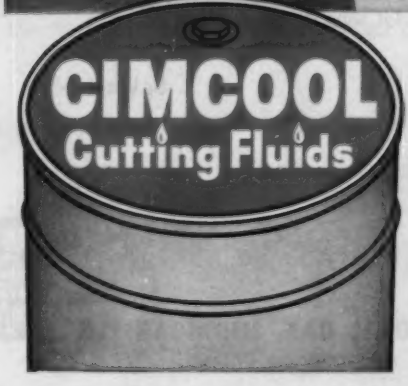

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Production-proved products of The Cincinnati Milling Machine Co.

CIMCOOL 52 Concentrate — The pink fluid which covers 85% of all metal cutting jobs.
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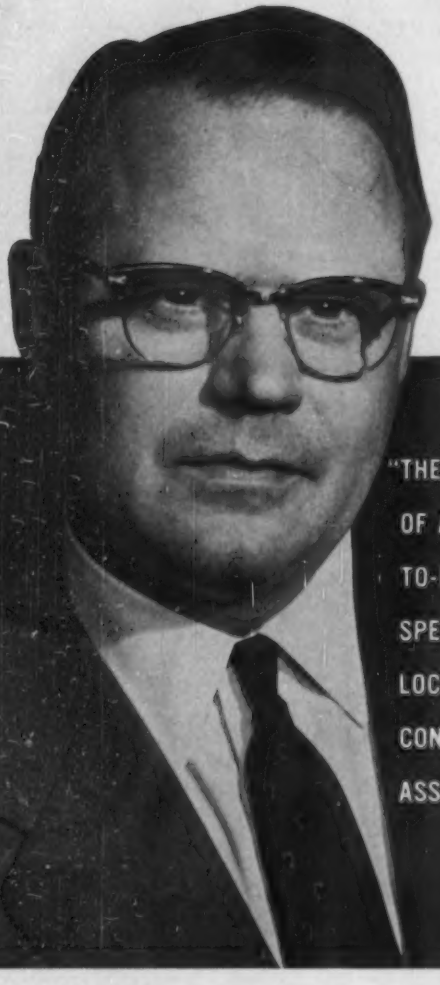
direct dial dimensioning system



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"Simply dial in the pre-selected coordinate dimensions, touch a button, the rest is automatic. The JIGMIL table and spindle head automatically position at the desired hole location in seconds. While the JIGMIL is machining, you can *pre-set* your next move. Developed by our own engineers, Diatrol adds to the inherent versatility and accuracy of the JIGMIL, further reducing human error as well as set-up and machine time. *Diatrol makes it possible to machine custom or small lot jobs at production rates.*"

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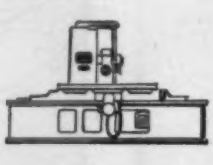

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ARMSTRONG "T" SLOT BOLT

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ARMSTRONG UNIVERSAL ADJUSTABLE CLAMP

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ARMSTRONG PLAIN CLAMP — ARMSTRONG SCREW HEEL CLAMP — ARMSTRONG GOOSE NECK CLAMP

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Whatever its shape, a work piece can be quickly, easily and safely set up on any T-slotted table with ARMSTRONG Set-up Tools. Comprising a complete "system" of supporting and holding devices in all essential sizes, ARMSTRONG Set-up Tools usually pay for themselves on the first job and continue to lower costs for years to come.

Save Time: Keep costly machines and high priced men producing—save time otherwise lost while operators rummage in the scrap box for materials with which to devise makeshift set-up methods.

Prevent Breakage and Spoilage—correctly designed, machined from special steels or drop forged and heat treated, they are extremely stiff, strong and reliable.

Increase Accuracy—hold work rigidly and support it fully regardless of shape.

Prevent Accidents—end risk of set-up failure with resulting tool breakage, damage or personal injury.

Increase Profits—by reducing down time, increasing man hour output, assuring accuracy, ARMSTRONG Set-up and Hold-down Tools cut costs and build profits. They are part of every properly equipped tool room and shop.

Your Local Armstrong Industrial Distributor carries a good stock of Set-up and Hold-down Tools. He offers you quick, efficient service on these, as well as other, quality ARMSTRONG Tools.

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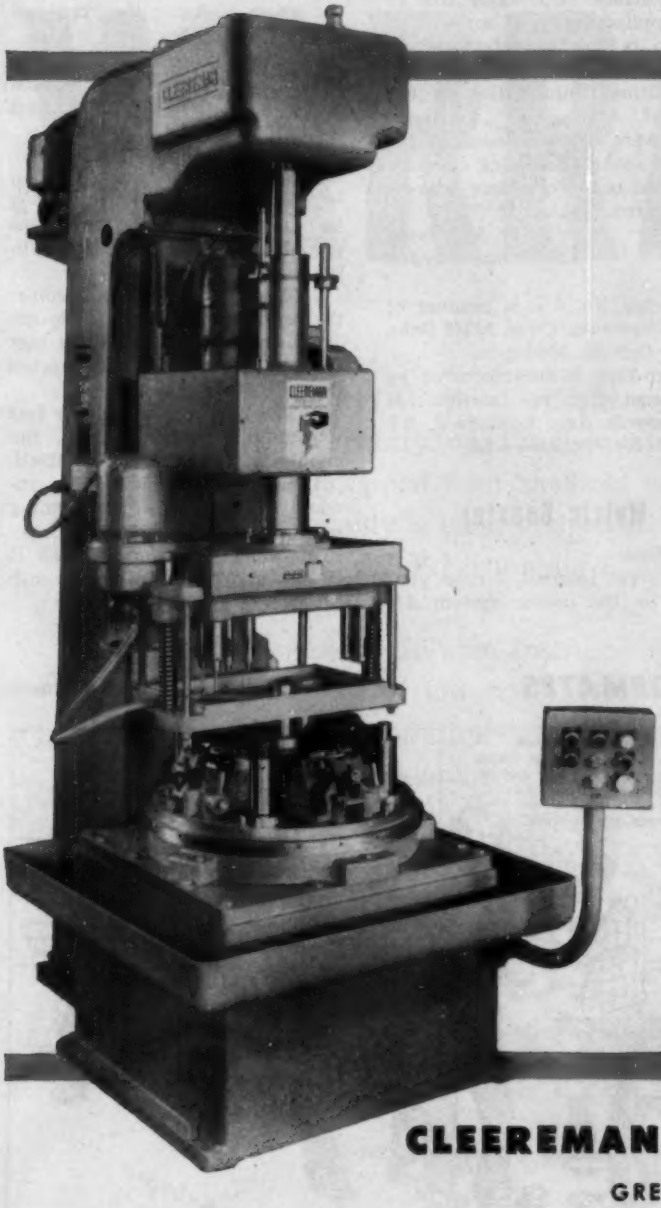
CLEEREMAN CREATES

Special Automatic Drilling and Tapping Machines adapted to your individual work problems at a moderate price



An example of one such adaptation is presented by the accompanying photograph which shows a standard Cleereman "Series A" Automatic Drilling and Tapping Machine equipped with Multiple Spindle Head and Rotary Index Table to produce thousands of finished parts week after week with an exceedingly low capital investment.

A fixed center, combination drilling and tapping head is attached to the flanged spindle quill of the standard machine. The multiple spindle head has six spindles arranged in three groups of two each. High speed, non-reversing spindles for drilling and chamfering are driven by an auxiliary motor mounted on the head; slower speed, reversing tapping spindles are driven by the machine spindle. Correct speed and geared tap lead are obtained by pick-off gears in the top head of the machine.

Rotation of the index table is timed with the spindle cycle to provide fully automatic operation. The machine operator loads the workpieces and depresses the "Cycle Start" pushbutton; the rotary table indexes; the spindles power rapid traverse to the work; drills, taps and chamfering tools feed; tapping spindles reverse at depth and lead out; spindles power rapid traverse up—and the job is completed—quickly—automatically—without fatigue or error.

What is your problem?

A specialized "standard" Cleereman Series A Automatic may be your answer for greatly lowered production costs and increased production with a nominal investment.

See your local Cleereman distributor, or wire, write, or phone direct.

CLEEREMAN MACHINE TOOL CORP.

GREEN BAY, WISCONSIN

General Distributors: The Jackson-Fotsch Company • 7350 West Lawrence Avenue • Chicago 31, Illinois

Why Pay For
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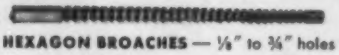
When You Can Get
STANDARD BROACHES
from **STOCK**

Minute Man
KEYWAY BROACH KIT

In one minute and for as little as one cent you can cut a keyway with the Minute Man Keyway Broach Kit. For keyways from 1/8" to 1" in any bore from 1/4" to 3".

SQUARE BROACHES — 1/8" to 3/4" holes



HEXAGON BROACHES — 1/8" to 3/4" holes

ROUND BROACHES — 1/4" to 1" holes

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LETTERS

to the editors

330 W 42nd St, New York 36, NY

Hard-surfacing

Dear Sirs:
In your issue of Oct 5 '59, we found many interesting articles.

On page 121, under the heading of "Hard Surfaces," you say, "The hard surface (Colmonoy No. 6) was applied by metal spray . . ."

Who is the manufacturer of Colmonoy? Could you please give us additional information on that subject?

We were also interested by the article about Ferro-Tick on page 87. What is the complete address of the manufacturer?

Sven A Nilsson
Eskilstuna, Sweden

Colmonoy No. 6 is a product of Wall Colmonoy Corp, 19345 John R St, Detroit, Michigan.

Ferro-Tick is manufactured by Sintercast Corp of America, 134 Woodworth Ave, Yonkers 2, NY (Attn: Mr Tarkan)—Ed.

Metric Booster

Dear Sirs:
With great interest, I read your notes on the metric system (*AM*—Jan 11, '60, p107), and I know that quite a few of my colleagues are also impressed by the discussions.

I have almost 15 years practical experience with the inch system and somewhat more in purely metric industry. Therefore, I can claim to know the "pro and con" of both sides.

I would like to make some remarks in reference to the eight points in the article entitled "Anti Metric":

1. Right. Re-education is necessary in order to get out of an old "rut." To a great degree, it is just mental inertia that keeps our overworked engineers with the antiquated system.

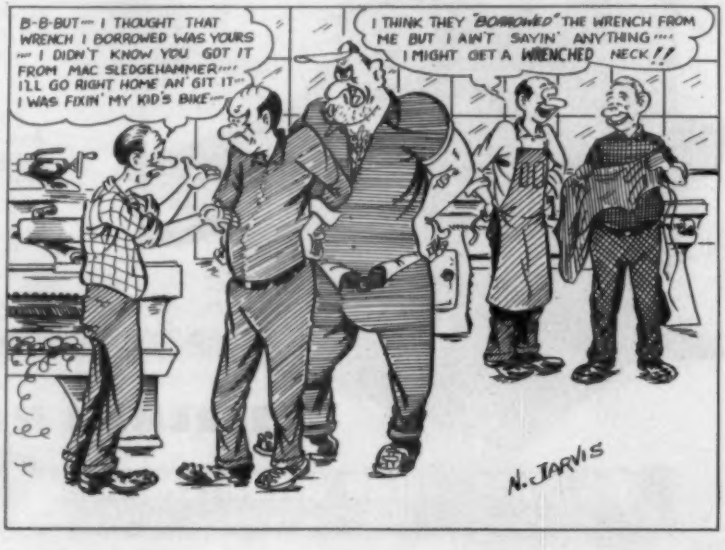
2. The conversion *will* come; the cost will be higher if we delay longer. The dual system cost will be reduced if we shorten the transition period.

3. The turnover of tools is fast in our days. Once started, the change will be propelled by itself.

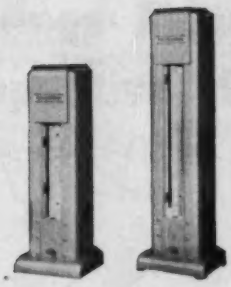
4. Metric units would be unwieldy only if we kept designing new parts to old dimensions, say 2 in. thick (50.8 mm). Make it 50 mm and start thinking in millimeters.

SHOPMATES

N. Jarvis


B-B-BUT— I THOUGHT THAT WRENCH I BORROWED WAS YOURS — I DIDN'T KNOW YOU GOT IT FROM MAC SLEDGEHAMMER... I'LL GO RIGHT HOME AN' GIT IT— I WAS FIXIN' MY KID'S BIKE—
I THINK THEY "BORROWED" THE WRENCH FROM ME BUT I AIN'T SAYIN' ANYTHING... I MIGHT GET A WRENCHED NECK!!
N. JARVIS

5 YEAR WARRANTY



The Sheffield Corporation offers a 5 Year Quality and Reliability Warranty on Precisionaire Column Instruments now being shipped with Sheffield gaging tooling.

The Warranty is clear and positive, as reliable as the performance of the Precisionaire Column Instrument which it stands behind.

Precisionaire Column Instruments have performed so well over a 20 year period that Sheffield can make this important assurance of reliability – *at no extra cost.*

Sheffield Precisionaire Column Instruments are the most versatile and trouble-free air gages you can buy.

For reliable air gaging, specify Sheffield. Ask your Sheffield representative for details about this Warranty.

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Available accessories:
18" transfer gage
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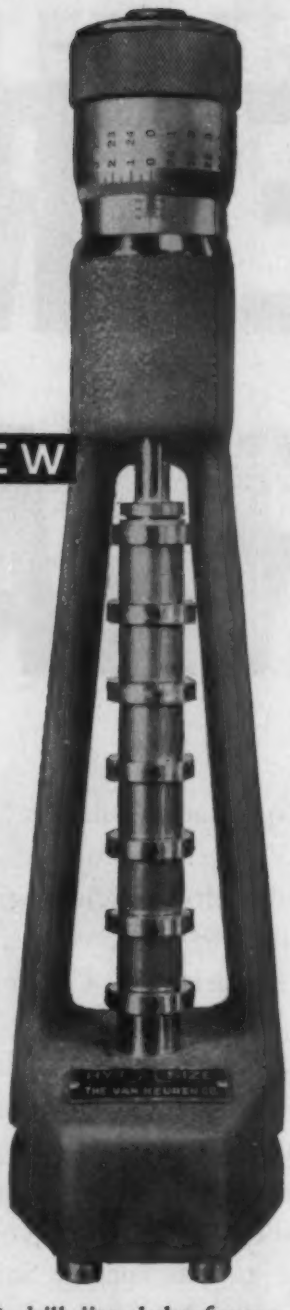

Your surface plate needs this NEW dimensional gage, the **VAN KEUREN HYT SIZE GAGE**

Here's why:

- it embodies the well-known *Van Keuren precision.*
- it has a decided price advantage.
- permits amazing speed in setting all dimensions (a matter of a few seconds!)
- it's accurate to .000050" over entire range.
- has exclusive design features: a patented spring-loaded non-rotating spindle eliminates backlash . . . measuring surfaces are accessible from front and back . . . it can be used in a horizontal position.
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- easily portable . . . can be used anywhere in shop.

Now you can more quickly inspect drill jigs, lathe fixtures, gears, cams, splines, profiles, contours . . . and check many shop operations. You can easily set precision depths on drill presses, milling machines, jig borers, etc.

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. . . rated the world's most accurate
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5. The problem is already here. Machine tool companies, for instance, have to build two sets of machines, one for export and one for home. This practice is spreading to other industries.

6. If we stick any longer to an isolation policy, we will soon be eliminated from world trade. I think we are strong enough to take competition.

7. So many new books are published every year; who uses old books, except for his dear handbook? Most professors take pride in publishing their lectures. They can give much impetus to modern thinking. Furthermore, we will gain a wealth of information, undreamed of by the general engineering public, by being able to evaluate European technical publications.

8. True, the inch system could also become consistent by following this path. But 10 in. must be called a foot, and 100,000 in. must be called a mile. The same applies to weights. Is it not better to adopt an already existing decimal system?

Dr Friedrich K Bielitz, chief
Mechanics and Dynamics Dept
Lycoming Division
Avco Manufacturing Corp
Stratford, Conn

We appreciate these lucid comments from Reader Bielitz, and we'd like to point out that the "Talking Shop" page gave equal space to each side of the question. The "Pro Metric" item appeared earlier (AM—*Dec 14 '59, p143*)—Ed.

"Well, if you can't give me a raise, how about the same pay but oftener."

CALENDAR

Society of Automotive Engineers—National Production Meeting, Mar 22-24, Statler Hotel, Cleveland, Ohio.

Pressed Metal Institute—Spring Technical Meeting, Mar 23-25, Pick-Carter Hotel, Cleveland, Ohio.

National Screw Machine Products Association — Annual Meeting, Apr 3-6, Hotel Ambassador, Los Angeles, Calif.

Society of Automotive Engineers—National Aeronautic Meeting, Production Forum, and Display, Apr 5-8, Hotel Commodore, New York, NY.

Annual Joint Conference on Automatic Techniques (ASME, IRE, AIEE)—Apr 18-19, Cleveland Sheraton Hotel, Cleveland, Ohio.

American Machine Tool Distributors Association—Semi-annual Meeting, Apr 18-20, Greenbrier Hotel, White Sulphur Springs, W Va.

Metal Treating Institute—Spring Meeting, Apr 20-22, British Colonial Hotel, Nassau.

American Society of Tool Engineers—Tool Show, Apr 21-28, Detroit Artillery Armory, Detroit, Mich.

Metal Powder Industries Federation — Annual Meeting and Powder Metallurgy Show, Apr 25-27, Drake Hotel, Chicago, Ill.

American Welding Society—Annual Convention and Welding Show, Apr 25-29, Great Western Exhibit Center and Biltmore Hotel, Los Angeles, Calif.

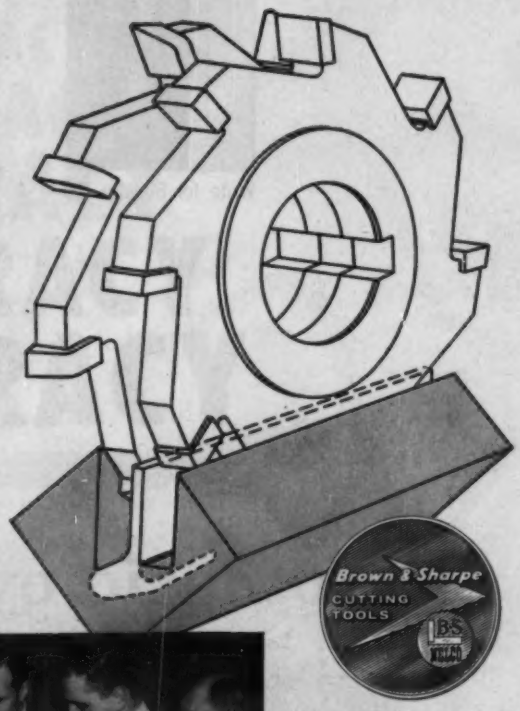
Instrument Society of America—Instrument-Automation Conference and Exhibit, May 9-12, Civic Auditorium and Brooks Hall, San Francisco, Calif.

American Society for Metals—Southwestern Metal Exposition and Congress, May 9-13, State Fair Park, Dallas, Texas.

American Foundrymen's Society—Castings Congress and Exposition, May 9-13, Convention Hall, Philadelphia, Penna.

Changing to NELCO Carbide Tipped Cutters gives Hinge Manufacturer Tremendous Competitive Advantage!

Drawing shows one milling operation that eliminated 5 others and completed cuts 6 times faster than cutters previously used.



Brown & Sharpe Cutting Tool Engineer demonstrates faster milling speeds and improved surface finish on aircraft hinge using Nelco Cutters in gang.

A Brown & Sharpe Cutting Tool Engineer, with the approval of management in a plant making aircraft hinges, assisted in effecting substantial production savings and improved quality on dozens of production milling projects.

Nelco Carbide Tipped Cutters now mill a 72" bronze hinge piece, in one pass, at 12 to 15 inches per minute feed and produce a superior finish. Formerly, a feed of 1 inch per minute was maximum. Time for another milling operation was reduced from one hour to 2½ minutes.

Tremendous production benefits can result from B&S Tooling Service.

A B&S Cutting Tool Engineer in your shop can show you how . . . and he will, if requested, hold a training course for machine operators in your shop.

There's no obligation. It's all part of the new B&S COMPLETE TOOLING SERVICE. Call your local B&S Distributor today.

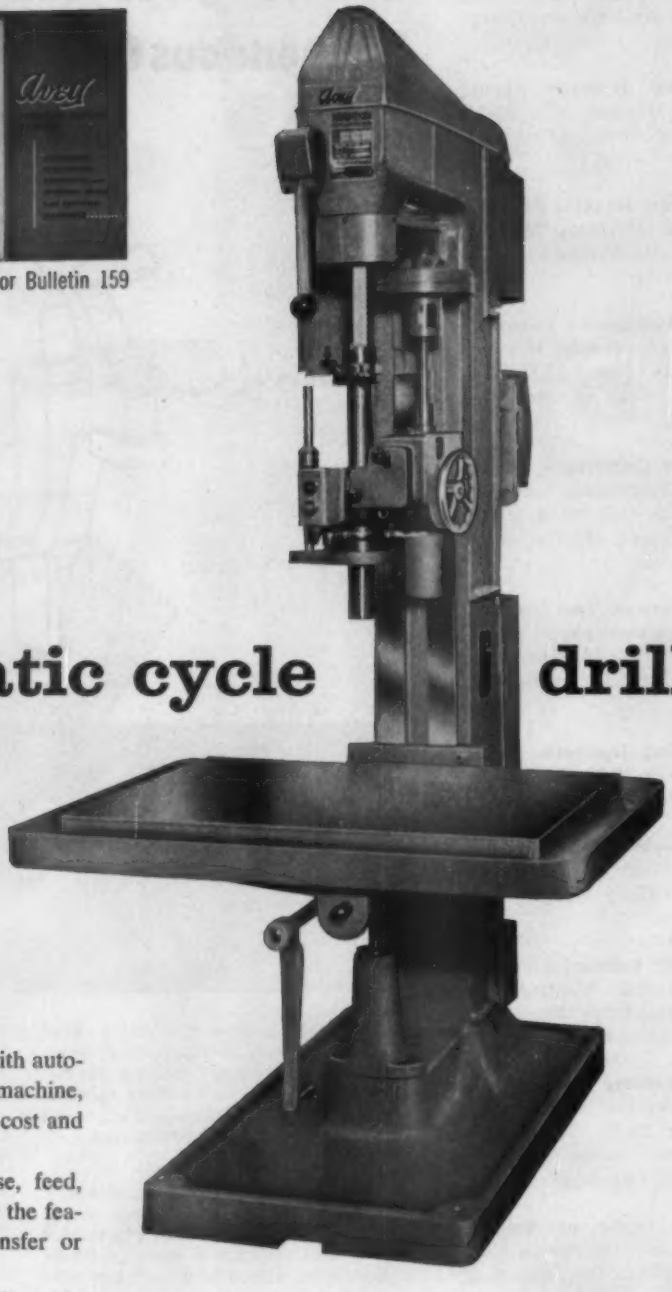
Send for the B&S-NELCO "Condensalog."

For that EXTRA Edge in Production

NELCO

NELCO Tool Co., Inc.
Subsidiary of:
Cutting Tool Division
Brown & Sharpe Mfg. Co.,
Providence 1, Rhode Island

Write for Bulletin 159



automatic cycle drilling

■ You can chop your time costs with automatic set-ups on this new Avey machine, and still take advantage of the low cost and flexibility of a standard unit.

Adjustable rapid power traverse, feed, and rapid return of the spindle are the features which permit automatic transfer or rotary index fixturing.

At the same time, you get adjustable feeds, speeds, table travel, head travel, and Avey's advanced spindle construction.

The machine is available with No. 2, 3, and 4 Morse Taper; 1 to 3 HP motors; single or multiple spindles. Your request for additional information will be promptly answered. Avey Division, The Motch & Merryweather Machinery Co., P. O. Box 1264, Cincinnati 1, Ohio.

Avey

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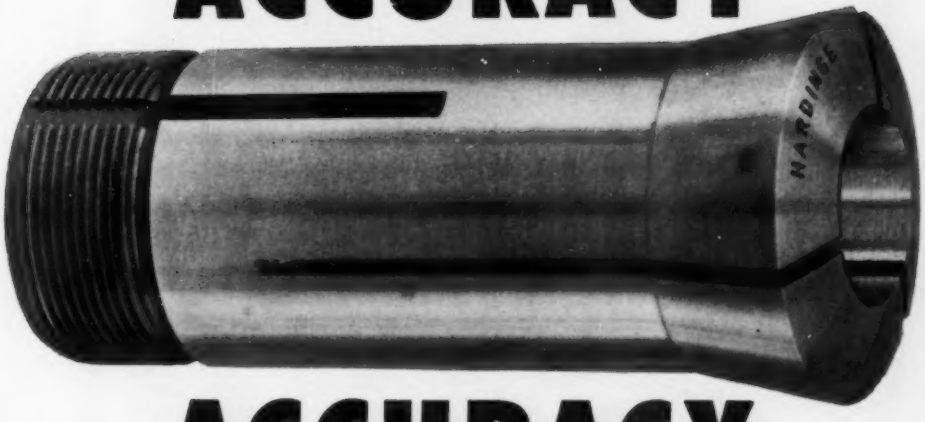

ACCURACY
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***HARDINGE** today stocks collets in sixteen principal cities in the United States and Canada.*
Ask for descriptive bulletins.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

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Collet stocks are available in Atlanta, Elmira, Portland, Boston, Hartford, New York, Philadelphia, Oakland, Seattle, Dayton, Detroit, Chicago, St. Louis, Minneapolis and Los Angeles, also Toronto, Canada.

CIRCLE 216 READER SERVICE CARD

CIRCLE 217 READER SERVICE CARD ►

G.E. turns motor shafts to close tolerances, cuts operating

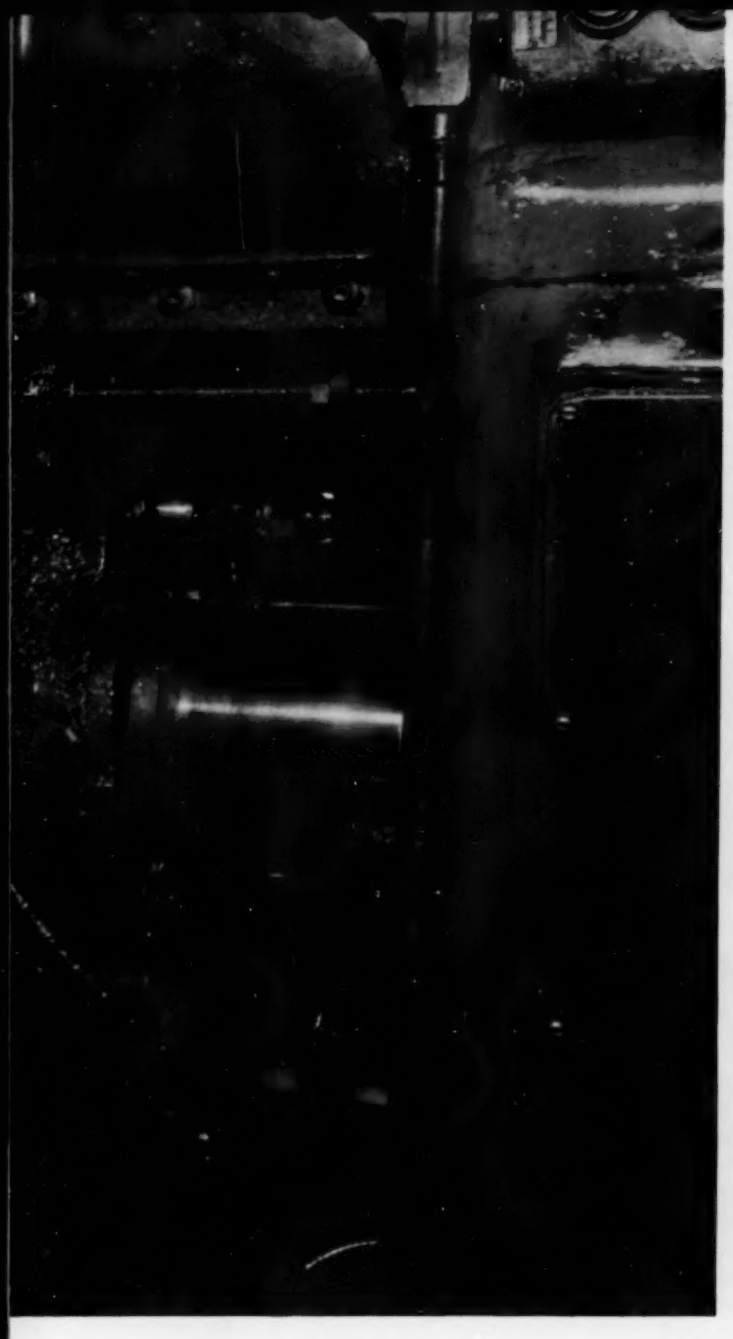
GULF MAKES THINGS

A dual purpose Gulfcut oil has enabled General Electric to achieve significant operating economies without sacrifice of machine speed or performance.

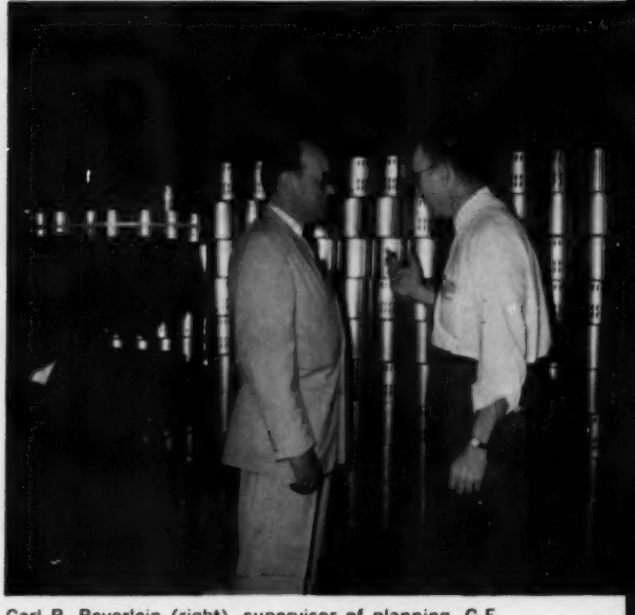
Gulfcut 41B—a sulfo-chlorinated-lard oil—is used by G.E. as the cutting fluid in their Conomatic bar machines, for machining four different sizes of motor shafts. Turned from C1212 steel at a spindle speed of 112 rpm, these motor shafts must be held to close tolerances to meet the company's high standards of product quality. G.E. reports that with Gulfcut oil they not only maintain exacting tolerances, but also get fine finishes and longer tool life.

In addition, G.E. gets effective lubrication of the headstocks and other parts of their 8-spindle Conomatics with Gulfcut 41B—a truly versatile oil.

Whatever the type of machining you do, there's an oil in the complete Gulfcut line to meet your every need. Call a Gulf Sales Engineer at your nearest Gulf office, or send for your free copy of "Metal Machining with Cutting Fluids," 116 pages on their selection and use.



Gulfcut oil enables 8-spindle Conomatics at General Electric, Linton, Indiana, to cut motor shafts to fine tolerances; helps give them precision finishes.



Carl B. Beyerlein (right), supervisor of planning, G.E., Linton, Indiana, discusses machining problems with M. S. Ringo, Gulf Sales Engineer.

costs with Gulfcut®...

RUN BETTER!

NEW 116 PAGE MANUAL tells all about cutting oil selection and usage. Send for free copy of "Metal Machining with Cutting Fluids."

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☐ Send literature on Gulfcut oils.
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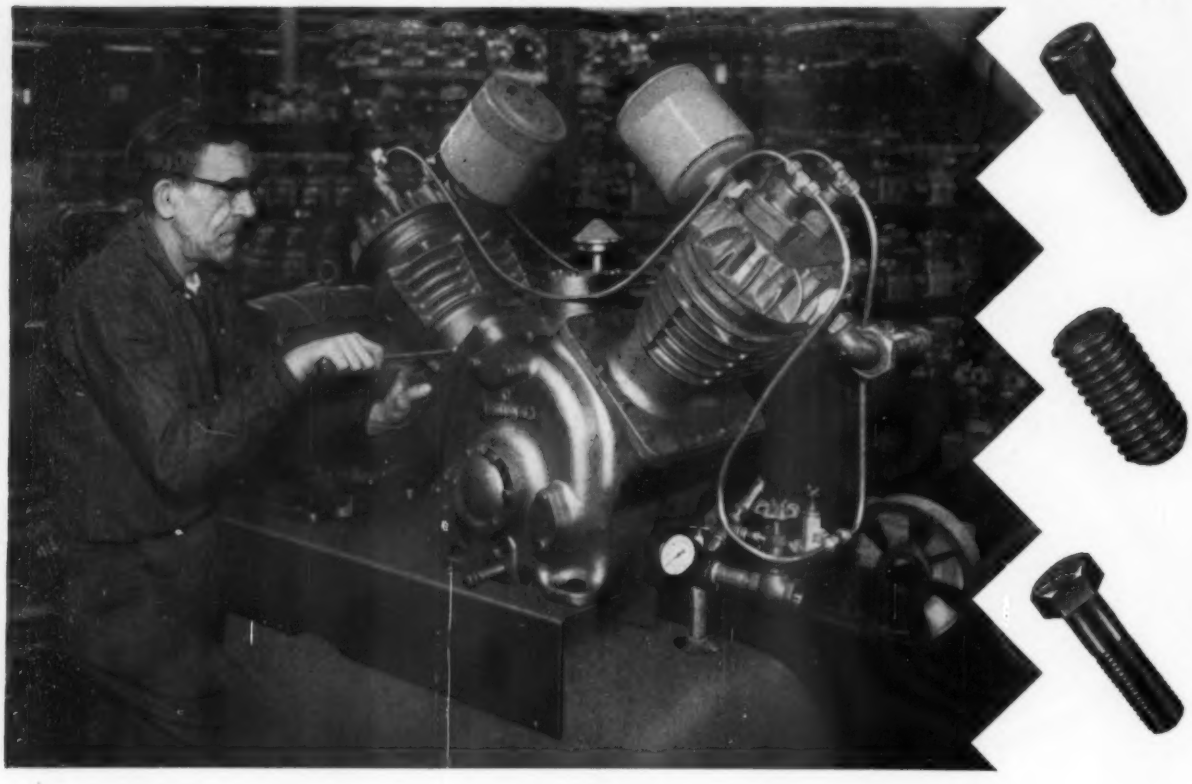
IT PAYS TO STANDARDIZE ON **STANSCREW**



Stanscrew provides faster service, adds safety for BRUNNER SINCE 1906 compressors

The fasteners this man is tightening must be really dependable. Dunham-Bush, therefore, maximizes the safety margin for its Brunner line by standardizing on Stanscrew heat-treated cap screws for all critical applications.

With tremendous production demands on its Hartford plant due to industry's preference for Brunner compressors, Dunham-Bush also demands a supplier who provides quick assistance on all occasions, and moves especially fast in emergencies. Stanscrew meets these requirements because complete stocks are maintained at three conveniently located plants . . . plus a management philosophy which looks on shipments within 24 hours as normal procedure, subject to drastic improvement in emergencies.

Fast delivery and reliable products are but two of many reasons more and more industrial leaders are switching to Stanscrew. A complete selection of over 5,000 different standard fasteners . . . experienced fastener specialists to provide qualified technical assistance . . . these and many other factors underline the advantages of specifying Stanscrew for your fastener requirements.

Why not call your Stanscrew distributor today. He will gladly arrange a prompt visit from the Stanscrew specialist who can often save you money . . . for example, by substituting a standard fastener for a costly special.

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STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois

◄ CIRCLE 218 READER SERVICE CARD

CIRCLE 219 READER SERVICE CARD

SPOT NEWS...

- **Union Twist Drill Co, Athol, Mass,** has announced a line of tool and cutter grinders to be made and sold by it Hartex Division. Hartex (UTD) line consists of a No. 1 cutter and reamer grinder, No. 2 form cutter grinder, Nos. 3 and 5 tangent-arc profile grinders, and No. 4 multi-point drill grinder. All these machines, except No. 4 drill grinder, are being built to American standards in West Berlin, Germany, by Hartex Division of R Stock & Co, subsidiary of Union Twist Drill. Hartex has built machine tools for more than half a century. The new line will be sold and serviced through machine tool distributors in the United States and Canada.

- **Ex-Cell-O Corp, Detroit, has purchased** Eastman Kodak's contour projector business. In an earlier move to round out its gage lines, Ex-Cell-O acquired the outstanding stock of Optical Gaging Products, Inc, Rochester, NY, which will operate as a wholly owned subsidiary of Ex-Cell-O.

- **Plastic two-thirds the weight of aluminum** and harder than steel has been developed at Kyoto University, according to reports from Tokyo. The synthetic resin, made from formalin (a petroleum and coal derivative), is said to be elastic and abrasion resistant. Possible uses include gears, other machine parts, and aircraft and missile components.

- **A large French machine-tool builder** will soon launch the first of a series of ten different copying lathes built to a large extent (about 50%) from modular components. Company expects to market the machines at prices below those of comparable tools produced in western Europe.

- **Binary titanium alloys** containing 8 to 40% germanium, hafnium, gold, and gallium possess good ductility and are stronger than unalloyed titanium says Imperial Chemical Industries, England. Addition of tin improves the forging properties. US research indicates that addition of tin in amounts from ½ to 22% can increase the oxidation resistance, without impairing strength or ductility.

- **A new line of electrical discharge machines** built by Wickman Ltd is being shown for the first time in this country by Burleigh & Stocker. These Erodomatic machines are based on Firth-Sterling's Method X, in which material is removed by pulsed electrical discharge.

- **Latest entry into the field of equipment leasing** is the Talcott Leasing Corp, New York City. All types of equipment, including machine tools, can be leased. Several leasing plans are available, all quite similar to those offered by Jones & Lamson and by Hertz (*AM/MM*—Feb 8 '60, p111, 83).

- **A license application for export to Russia** of around $6 million of US transfer machines is reported pending in the Commerce Dept. Favorable action is expected on the application, but government officials have not been in a hurry to act on it. Two licenses were granted recently (*AM/MM*—Feb 22 '60, p87), but the Commerce Dept does not intend to approve in a rush any sizable number of machine-tool export licenses.

They All Agree... You Can't Beat a Simonds High Speed Steel Metal Cutting Band Saw

Tom— the band saw operator, says:

"With Simonds saws I get straight, accurate cuts with a smooth finish."

Dick— the production manager, puts it this way:

"Since we've been using Simonds we lose lots less downtime for blade changes. Simonds blades seem to stand up better under high speeds and heavy feeds. Our cut-off production results are better."

and Harry— the purchasing agent, says:

"We've been using Simonds bands for some time now. I like the easy availability from our local distributor. We don't have to wait for delivery or for service."

Why not put a Simonds High Speed Steel Metal Cutting Band to work for you and find out how much better it really is? Call your Simonds Distributor now.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.
SIMONDS Industrial Supply DISTRIBUTOR

Factory Branches in Boston, Chicago, Shreveport, La., San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

WASHINGTON...

Great defense debate...

The political debate over our defense posture—"Is it good enough to meet the Soviet threat?"—will get hotter and hotter.

For one thing, there's evidence that Eisenhower is no longer the man whose word on defense is automatically accepted as the last word—notably in Congress. Naturally, any president has the last word on the subject, but the public questioning of Eisenhower's handling of defense has become more prevalent than ever.

Defense outlook...

As the defense debate shapes up now, the odds are Congress will tack on an extra $1 billion or so to the Eisenhower administration's $41-billion budget. The projects most likely to be favored: B-70 bomber development, the Polaris missile-submarine, the Minuteman ICBM, and reconnaissance and early-warning satellites.

There's much less likelihood that Atlas or Titan ICBM production will be increased beyond present schedules (the program now calls for a total of 270 operational missiles). The Air Force tells Congress that unless additional orders are placed by April of this year, the extra missiles could not be delivered before the more sophisticated Minuteman missile is in full production.

In the past the Eisenhower administration has dragged its feet on the expenditure of extra defense funds. But the fiscal 1961 military funds will be available to a new administration. A Democratic administration would be virtually committed to accelerating military outlays. Insiders feel that a Republican administration headed by Richard Nixon might do the same.

Defense plant security rules...

The White House has issued new personnel security rules for defense plant workers. Last year the Supreme Court ruled that the administration's previous industrial security regulations were invalid because of the absence of specific Congressional or Presidential authority.

Key points in the new White House order: The right of employees who are denied a security clearance to obtain a detailed statement of the reasons for the denial, to defend themselves against charges of being security risks, and to confront and cross-examine accusers whose charges are responsible for the denial of the security clearance.

Lack of such rights in the past has led to widespread criticism of the government's industrial security policy. But even under the new rules there are exceptions to the right of confronting and quizzing accusers.

The major exception: If the accuser is a "confidential" government agent whose identity cannot be revealed.

Under the administration's policy—both the old one and the new one—when a company prepares a bid or negotiates a contract involving classified defense work, its key personnel must be cleared by the government for access to classified material.

Anti-trust drive...

The Justice Dept has begun one of the most thorough and hard-hitting anti-trust campaigns ever conducted against a single industry. The target: electrical equipment manufacturers.

The industry leaders—GE, Westinghouse, Allis-Chalmers, I-T-E Circuit Breaker, and Federal Pacific Electric—are named in the first cases.

The companies are charged with conspiring to fix prices and conditions of sale; allocate among themselves the business of supplying government agencies; submit noncompetitive, collusive, and rigged bids for supplying both private industry and government; refrain from selling certain types of equipment components to other manufacturers of electrical equipment; and raise the prices of certain types of components bought by other equipment makers who sell in competition with the defendant companies.

Outlook for depreciation...

Special legislation affecting the sale of depreciated equipment is off to a good start. The Ways and Means Committee scheduled three days of hearings on the bill which is co-sponsored by the two most powerful members, Chairman Wilbur Mills (D-Ark) and the top Republican, Rep Noah Mason (R-Ill).

The bill would require that income from the sale of fully-depreciated capital equipment be taxed at the 52% corporate income tax rate—instead of the 25% capital gains rate.

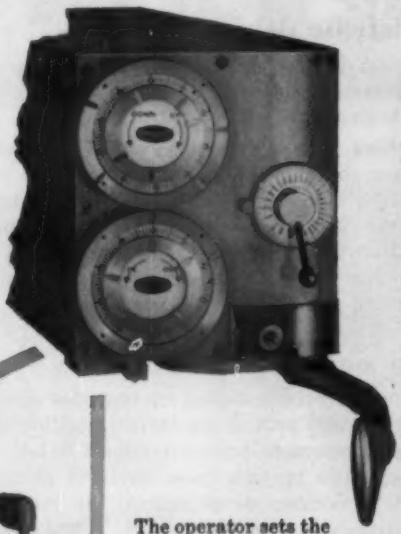
Treasury Secretary Anderson has promised that if Congress approves the legislation, he will then instruct Internal Revenue agents to be more liberal with businessmen who want to take larger amortization deductions to write off their investment over shorter periods of time than the IRS men now allow.

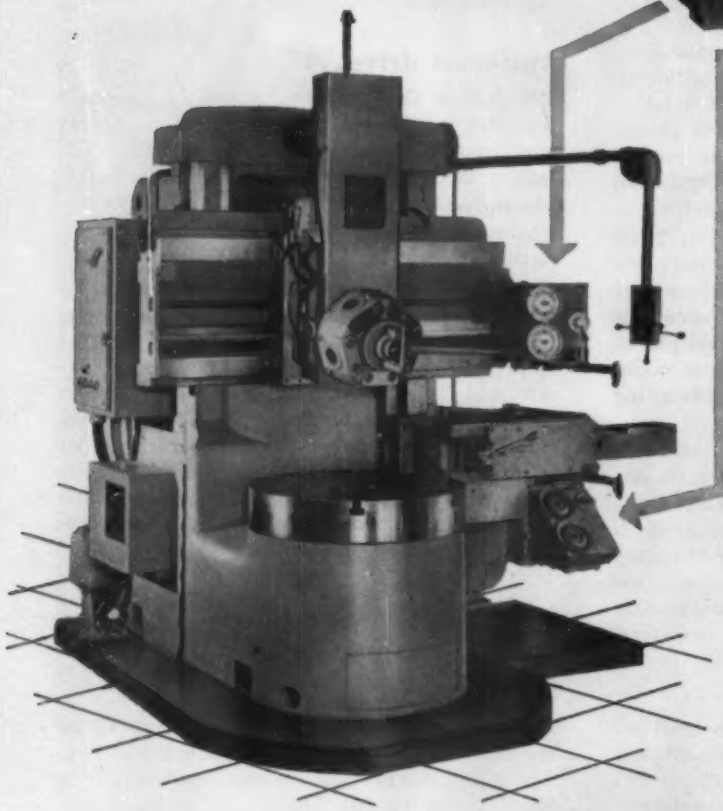
BULLARD

DYNATROL* V.T.L.

Obsoletes Handwheels

A completely new concept in measuring, utilizes large, easy to read, clock-type dials with dual pointers.





The operator sets the movable clips, around the dial, to conform with the workpiece requirements and by rotating the pointers to these settings he *knows* the tool is precisely located for the operation to be performed. The graduations and numerals remain stationary while the pointers rotate, one registering tenths of an inch and the other thousandths, for exact head positioning.

When coupled with the unique DYNATROL* control, this accurate measuring system eliminates the need for handwheels, for head-positioning, in either feed or traverse and increases the productive time of the machine.

* Trade Mark

Ask your Bullard Sales Representative about the many other features which make the Bullard DYNATROL* the *first* fully power-controlled vertical turret lathe.

THE BULLARD COMPANY, Bridgeport 9, Connecticut.

High-Spot Features of the DYNATROL* V.T.L.

Dynatrol V.T.L. is POWER CONTROLLED

By lever or pendant — it's your choice — head traverse rates can be varied from zero to nine feet per minute. Easy-to-read dials show exact position.

Feed selector gives infinitely variable feed rate without interrupting the cut.

Dynatrol V.T.L. is VERSATILE

Available equipment includes:

Bullard variable speed drive for infinitely variable table speeds throughout the full range with no loss of usable horsepower.

Fully automatic operation by Bullard Man-Au-Trol or point-to-point or continuous path numerical control systems.

Unique Size-Au-Trol* for accurate positioning of all heads. Contouring attachments: Hydraulic, electronic or electro-hydraulic. Four- or five-sided power-indexing turret heads. Thread cutting, drum scoring and angle turning attachment. Power-operated chucks.

Dynatrol V.T.L. is COMPACT

The new Bullard Dynatrol V.T.L. is compact in design, rigid in construction, lower in height, reduced in floor area.

Dynatrol V.T.L. is EASY TO MAINTAIN

Automatic lubrication throughout... fewer parts... fewer adjustments... easily accessible.

"YOU CAN'T BEAT A BULLARD"

DETROIT...

Production has softened...

Two weeks ago this column warned that auto production was due for a cutback, and, as it turned out, the industry moved faster than our printer. So far 270,000 units of various makes have already been lopped off first quarter production, and a cut of another 100,000 is possible. Total production for the quarter is now envisioned as about 1,900,000 cars.

Preview of 1961...

Biggest news for the coming year is Project "X", a not-too-imaginative name used internally by Cadillac to designate a relatively compact, four-passenger sports hardtop due for public introduction in the spring of 1961. This car is very similar in size to Ford's Thunderbird, but the price tag will be strictly Cadillac. Standard Cadillacs will continue their usual, finny theme, with a cowl structure that is common throughout the GM line on down to Chevrolet. Check this on current models if you wish: Both cars share a 1740.1-sq-in. windshield of identical contour.

Buick, too, is repeating its same basic structure for the third year in a row. As on other GM cars, major styling change will be near elimination of the "dog leg" that tends to interfere with entrance and exit. Buick will also straighten out its "V"-line in the rear to gain more luggage space. Odds are, too, that a fourth model will be added to the line, fitting in as a replacement for the popular, performance-packed Century of two years ago. Larger Buicks are destined for disc brakes on the front wheels.

The standard-sized Chevrolet is described as having undergone a major sheetmetal change to finally eliminate the controversial "gull-wing" look at the rear. Pontiac and Oldsmobile also will be treated to major facelifts, but will retain the common GM cowl structure.

One of the hottest rumors drifting around Detroit is the possibility, now in the talking stage, of a drastic cut in the variety of cars now offered by Buick, Oldsmobile and Pontiac, cars that widely overlap in price and purpose. The scheme, if it ever develops, counts on the forthcoming compacts scheduled for each of these makes to give the dealer a sales base, and the cream would be a single luxury line of several basic body models. However, the latter would differ more significantly in size and price.

The configuration of GM's new crop of compacts has been pretty well established. Buick and Oldsmobile versions will share an aluminum-block V-8 mounted in front. Pontiac has settled on OHV-four (*AM*—Dec 28 '59, p55) inclined at a 45° angle, also in front. This engine, of cast-iron construction, is essentially half of the current V-8 used in bigger Pontiacs. Each of the three cars will adopt much of the existing Corvair body structure, but will be longer to accommodate their front-mounted engines.

Corvair itself will continue with little change, although that statement hardly reflects the intensive effort put out behind the scenes to eliminate all bugs from the radical, air-cooled six. By 1961, the company will have ready a complete line of compact trucks, using the Corvair engine in the rear. A station-wagon model is due by mid-summer of this year.

Chrysler will attempt to coast with minor facelifts. The Valiant, for example, will change the shape of its taillights and drop the pseudo spare tire mount on the rear deck. Dodge will concentrate on Dart production, along with an elongated Valiant, probably to be called the Lancer, of its own. It will keep one longer luxury model in the line though, for the carriage trade, a car that will be Dodge's last grasp at the medium price field. Valiant will add a convertible to its line.

Biggest upheaval for the future stems from Dearborn where Fords are made. The Lincoln line for 1961 will be cut to the Continental, and by 1963 at the latest, it will share T-Bird tooling. This car will be available in four-door sedan and four-door convertible form to augment its two-door cousin. The 1961 T-Bird will differ in front, with a convex grill reminiscent of many electric razors. Standard Fords will have almost lost their fins. By 1963 there will be a new and as yet unnamed car in the line that will weigh in at about 3000 lbs. Ford also is working on a front-wheel-drive, four-cylinder "compact compact" of about 95-in. wheelbase to compete directly with Volkswagens and other minicar imports.

In **the truck field**, Ford will go smaller and bigger. Due by mid-March is a new version of the Ranchero pick-up based on the Falcon body shell. For 1961, Ford will offer compact cab-forward trucks quite similar in appearance to Willys and existing Volkswagens. At the other extreme will be a giant, diesel-powered, cab-over, highway tractor that will up Ford's maximum GVW range to 60,000 lb.

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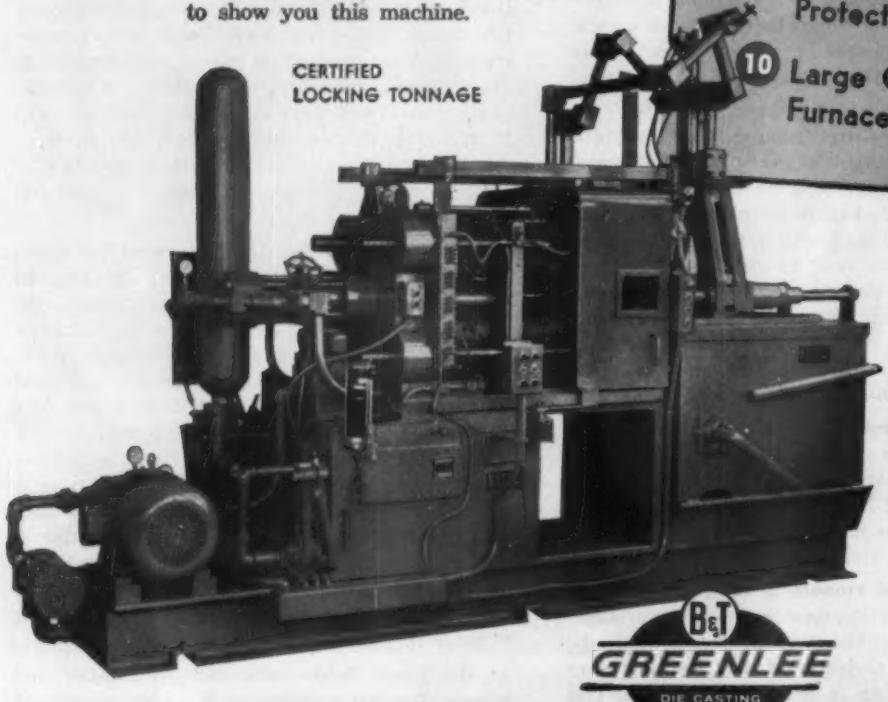

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AIRCRAFT and MISSILES...

Another missile race...

The US and the Soviet Union are now racing to produce an operational air-launched ballistic missile. Soviet work is well under way.

Our Defense Dept has finally issued a go-ahead to begin serious development of the Air Force's GAM-87A Sky Bolt ALBM. Until now the project has been limited to design study work.

Douglas Aircraft is the prime contractor for the weapon system. Other major contractors: Aerojet-General, solid-propellant rocket engines; Northrop Corp's Nortronics Division, guidance; General Electric, the nose cone.

The missile is designed primarily for use on the Boeing B-52G and B-52H jet bombers which are now carrying Hound Dog missiles. Only slight modifications of the planes would be necessary. But the Sky Bolt would also be the key weapon when and if the B-70, or a nuclear-powered craft are ever ordered into production.

New bomber planned...

Still another possible platform for the new ALBM is the Air Force bomber now being planned. A low-speed craft whose primary feature would be its extraordinary capability for sustained flight. The purpose would be to make the plane an aerial platform from which to launch missiles, rather than make this "bomber of the future" a craft whose characteristics would be close to that of a missile itself.

Rand Corp is directing the study of the plane, which would be conventionally fueled, not atomic powered. There's talk of such a plane being able to fly for ten days.

No new technical breakthroughs are necessary, the Air Force says. Existing components designed around a perforated laminar-flow wing can do the job. Power would come from conventional jet engines burning conventional jet fuels. Among the aircraft companies reportedly interested are Boeing and Northrop.

Who pays for development?...

Defense contractors beginning July 1 will have to dig into profits to underwrite part of the cost of company-initiated development programs which formerly were treated as fully allowable items of expense for cost and incentive type contracts.

This was spelled out in a recent revision to the Armed Services Procurement Regulation. The Air Force has already called in more than a dozen major contractors and reportedly asked them to share about 50% of the cost of development. Each agreement will be negotiated separately.

The Air Force has encountered considerable objection from industry because contractors see this new policy as another blow to profit margins which many believe are already too low.

As one Defense Dept official put it: "Industry will have to finance such efforts out of existing profits as the price for staying ahead in defense technology to assure future business, or else curtail its development program."

This new Air Force policy does not apply, however, to development programs specifically contracted for by the armed services.

Small contractors pooling jobs...

Fifteen Los Angeles area companies will handle defense contracts jointly in a new pooling organization known as the Production Research & Engineering Pool. Only companies with less than 500 employees may participate. The organization just recently has received approval from the Small Business Administration, Defense Dept and the Attorney General's Office.

Research lab nears completion...

Republic Aviation's $6-million R&D center on Long Island is nearing completion. Scientists and engineers will be moving in this month, and the lab, really seven individual labs, will be fully operational by late spring.

The laboratories will study such problems as space environment, re-entry simulation, and nuclear radiation. Work on plasma propulsion for space vehicles, already under way, will be expanded as will development work on high-temperature hydraulic systems and studies relating to establishment of a manned observation post on the moon.

Republic currently has a backlog of $511 million in orders, and employment is steady at over 15,000, down slightly from 16,000 a year ago.

More money for Man-in-Space...

The House has unanimously approved the President's request for an additional $23 million to avert a slowdown in the Mercury man-in-space program and revamp rocket launching pads at Cape Canaveral, some of which will be used in project Mercury.

The bill would increase appropriations for NASA in the current fiscal year to over $523 million.

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CIRCLE 223 READER SERVICE CARD

MACHINE TOOLS...

Why so much obsolescence? ...

A study to determine why privately-owned metalworking plants are letting their equipment become progressively obsolete is to be made by the Business and Defense Services Administration. It will be financed jointly by BDSA, which is a division of the Department of Commerce, and by Office of Civil and Defense Mobilization.

A second purpose of the study is to find out why manufacturers have not taken advantage of the liberalized depreciation methods made available in the 1954 overhaul of the tax code.

Kurt Rosinger, chairman of BDSA's Industry Evaluation Board, will direct the study, which will be under the general supervision of an Interagency Steering Committee. Represented on this committee will be OCDM, Commerce, Treasury, Defense and Small Business.

Bureau of the Census will have the job of making the physical survey.

Four-point program proposed . . .

This study is the most important project in a four-point program to decide how the nation's tool mobilization base can be strengthened.

Commerce Department is to make a separate study, as the second part of the program, of how exports of the U S metalworking equipment industry can be increased and to what extent foreign suppliers may be "manipulating the market" here by extending long-term credit.

Bureau of the Budget, as the third part of the program, is to point out to all machine-tool owning agencies of the federal government the savings to be made by modernizing production equipment currently needed. It also is to emphasize the importance of the increased efficiency thus attained to our national mobilization base.

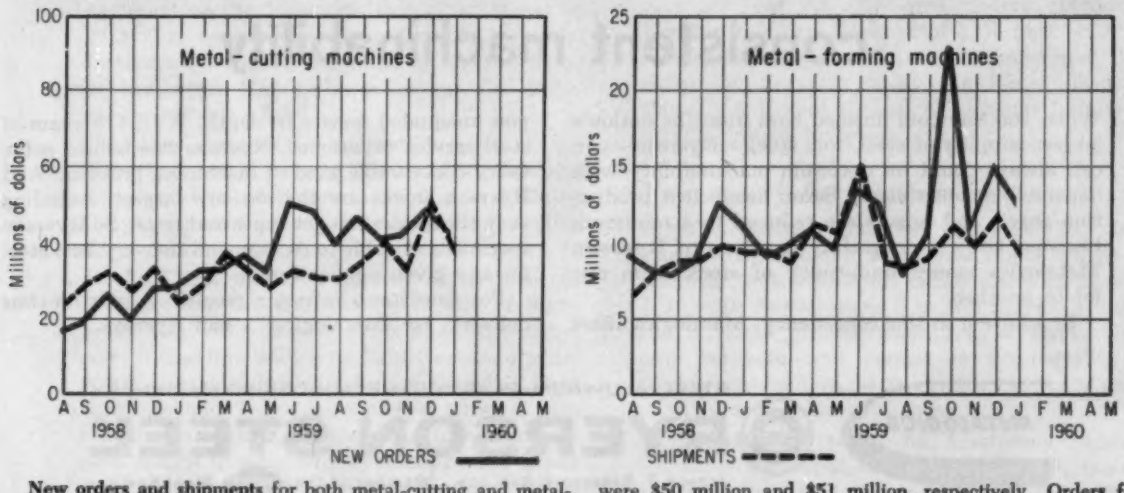
Back of the Budget Bureau's effort apparently is a desire to try to get the Defense Department's long-standing machine-tool modernization program off dead center.

Small Business Administration, as a fourth part of the program, is to draft a legislative proposal to give it authority to guarantee loans for equipment modernization "where justified by savings in production costs."

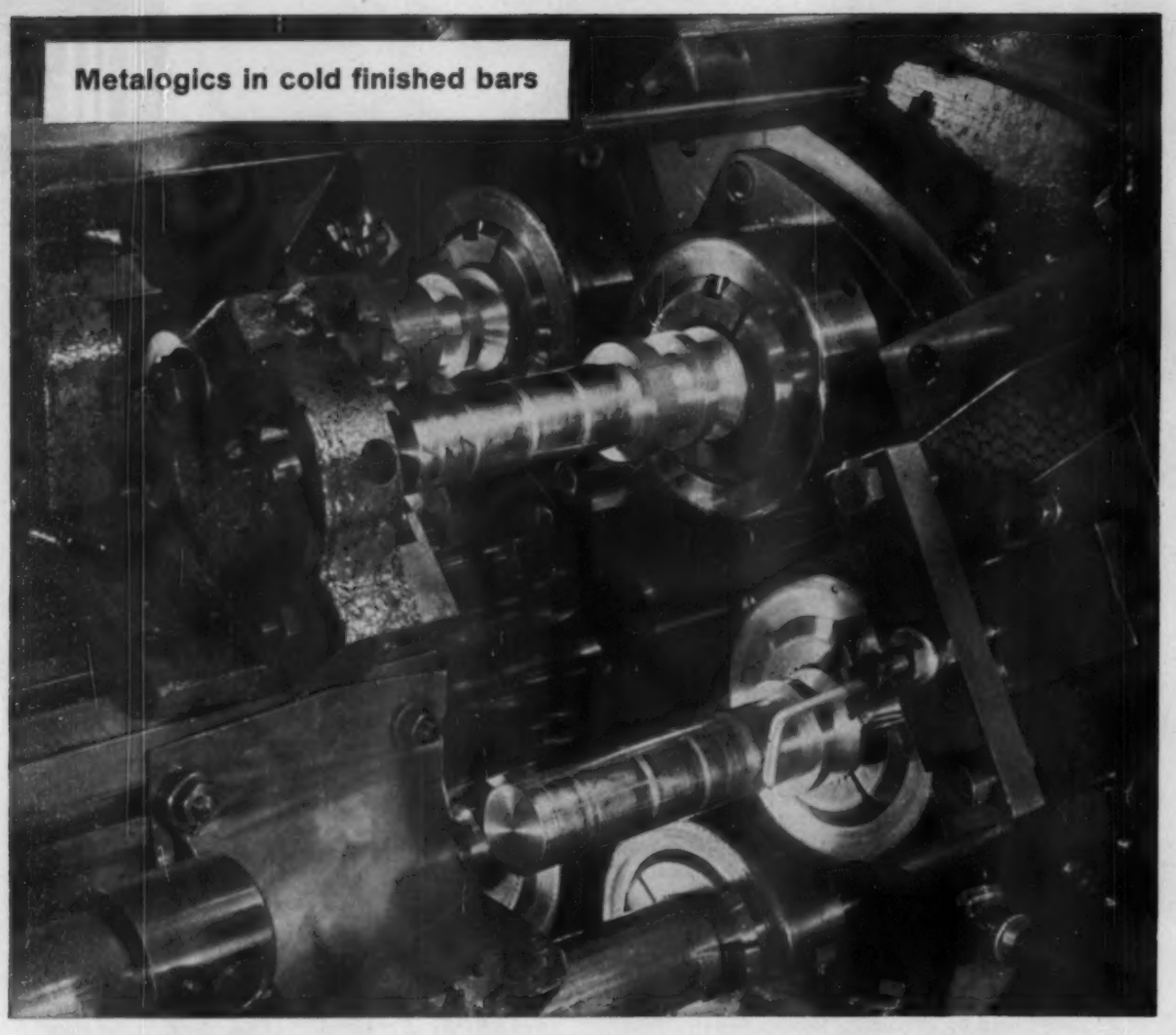
Top SBA officials point out that since 1953 they have made hundreds of loans from a revolving fund for just such purposes, some of the loans being with bank participation. These officials, who say that they had $200 million of lendable funds at the end of January with more money than borrowers, see little benefit from a loan-guarantee program.

The four-point program proposed by OCDM and discussed by director Leo A Hoegh with a group of top machine tool industry officals on February 18, came out of recommendations made by a government interagency review of a 26-page letter submitted last year to OCDM by the National Machine Tool Builders' Association.

NMTBA Index of machine tool new orders and shipments



New orders and shipments for both metal-cutting and metal-forming machine tools failed to meet expectations during January. Net new orders for metal-cutting machines ran to $43,950,000; shipments to $37,050,000. December figures were $50 million and $51 million, respectively. Orders for metal-forming machines ran to $13,050,000; shipments to $9,400,000. December figures were $15 million and $12 million, respectively



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MATERIALS...

Uranium for stronger alloys?...

Low-carbon steel can be improved in a number of ways by adding depleted uranium, according to reports on Canadian and US research. (Depleted uranium is the pure metal after removal of the nuclear isotope. It has all of its physical and chemical properties but no radioactivity.) Research activities stem from a search for some practical uses for a growing stockpile of this metal.

As little as 0.3% uranium in carbon steel provides increased depth hardenability, plus greater tensile strength, impact resistance, fatigue resistance, salt resistance, and makes the alloy relatively non-corrosive. Additions as small as 0.02% U have shown alloy improvement but quantities between 0.1 and 0.3% appear most effective.

Heavier steel sections are easier to heat treat when the alloy contains added uranium. It is possible that uranium may replace (in whole or in part) tungsten, nickel, chrome, and boron additives. Optimistic researchers are talking about using 80 million pounds of uranium a year for this purpose.

Blending uranium with lead, tin, or copper produces "a superior combination for metal bearings," according to metallurgists at the US Bureau of Mines. However, they emphasize, research on non-ferrous metals is in its earliest stages. Work is being done at the Bureau's Rolla Metallurgy Research Center.

In the US, research is fostered by the Atomic Energy Commission in cooperation with the Department of the Interior's Bureau of Mines. A study has been prepared by Battelle Memorial Institute, Columbus, Ohio, and by Arvid J Strod of Industrial Metals Improvement Co, Pittsburgh, for the AEC.

Canadian research is by metallurgists of the Department of Mines and Technical Surveys plus one employee of Eldorado Mining & Refining Co, official uranium coordinator of the Canadian government.

In the USSR, research appears to be directed at improving the temperature factors of high-grade steel—the chrome steels and other alloys—with uranium additives. Saul Gertsman, chief of the metallurgical division of Canada's Dept of Mines and Technical Surveys, Ottawa, says that this is a minor application of true uranium-steel alloys; that the improvement of low-grade steels, for peaceful purposes, is far more beneficial.

As an additive for steel, uranium is not a new development. Even before World War I it showed great promise for toughening armor plate and gunbarrel alloys. However, production problems developed and other techniques seemed more practical. The cost of solving the problems outweighed the apparent value of using uranium. Today, the large-and-still-growing stockpiles of depleted uranium, resulting from nuclear activities, demand an outlet. Hence, the cost balance has shifted and its potential use in metallurgy is being revived.

India expands aluminum output...

Indian Aluminium Co, Ltd will substantially expand its bauxite, alumina, aluminum ingot, rolling mill, and extrusion facilities in India. The integrated program—from bauxite through ingot into sheet and extrusions—will cost approximately $17 million. Largest segment of the plan is to add 11,200 tons of primary ingot capacity, doubling to 22,400 tons the present capacity of the firm's Hirakud smelter. Aluminium Limited of Canada, sponsor of the project, has a 65% interest in the Indian company.

Program was made practical by a supply of power from the 165,000 hp hydro-electric project constructed by the State of Hirakud on the Mahanadi River. Also, the India Aluminium Co opened a new 11,200-ton-capacity aluminum smelter in the State of Orissa in February. Consumption of aluminum in India reached 36,300 tons in 1957—150% above 1950.

Rolled products from the mill at Belur, West Bengal, will be expanded from 10,000 to 18,500 tons per year. An additional modern extrusion press, with a ram pressure of 3300 tons, will be installed at Alupuram, Kerala. Financing of the expansion program is by the Export-Import Bank, the United States, Aluminium Ltd, and private Indian investors.

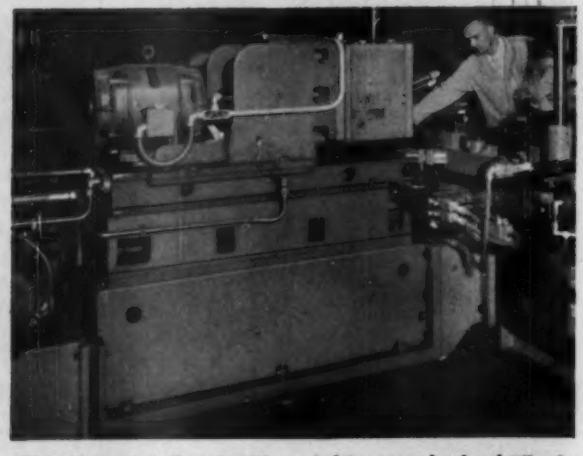
New epoxy for laminating...

Dicyclopentadiene dioxide, Epoxide 207 for short, when coupled with glass fibers, offers a laminate that withstands temperature up to 600 F. In some formulations it is said to have a tensile strength greater than that of steel. The new laminate will appear in printed-circuit boards, automotive parts, piping, aircraft and missiles, and home appliances.

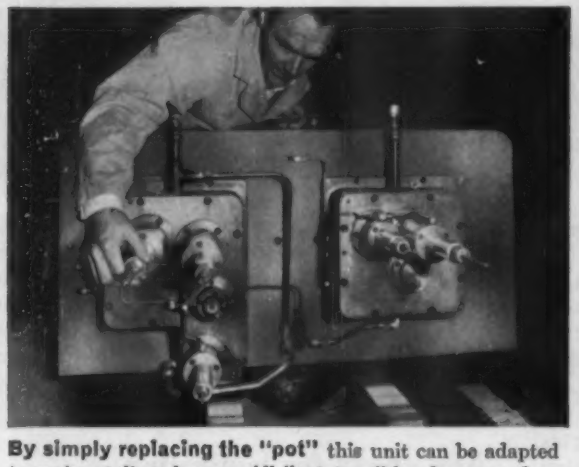
Consumption of resins for reinforced plastic laminates was about 200 million lb in '59. About 4 million lb of this was epoxy. Total consumption is expected to triple in three years. The new epoxy should contribute to this growth.

HOW BARNESDRIL PRODUCTION UNITS SAVE MONEY THROUGH FLEXIBILITY!

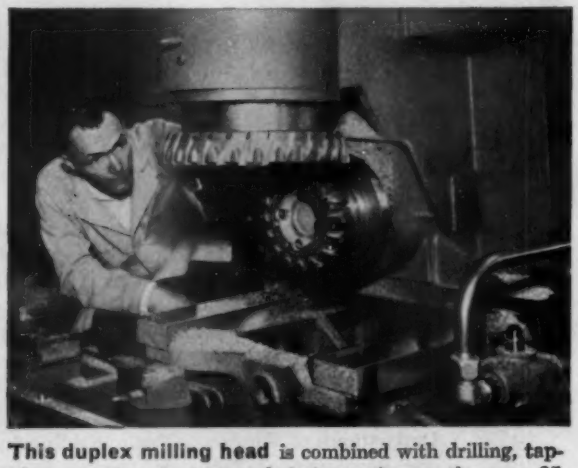
BarnesdriL units regroup easily . . . economically. A leading automobile manufacturer, for instance, is reducing the costs of tooling for a new transmission case by using BarnesdriL units from an obsolete motor block line built to the "Building Block" principle. "Before and after" parts are illustrated.



This "obsolete" unit will go right on producing! That's because BarnesdriL unit and slide assemblies are separate. Base and column sections are separate, too, for widest possible flexibility. Units have inserted hardened and ground steel ways, with saddle type construction to reduce height of auxiliary heads.



By simply replacing the "pot" this unit can be adapted to major styling changes. All "pot type" heads are used on this line. Pallets used to hold the work fixtures also can be re-used when the machine is rebuilt. Since pallets rise very little from the rest pad for indexing, they automatically sweep chips into the flume.



This duplex milling head is combined with drilling, tapping, reaming, boring, and facing units on the new 35 station machine. Gross production rate is one case every 36 seconds. For easy maintenance, hydraulic cylinders on BarnesdriL units can be removed by loosening 4 bolts and uncoupling the tie rod.

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WHAT'S AHEAD... in Metalworking

TRENDS

Automobile cutbacks slow production gains...

Metalworking production continues to rise to new heights, though the rate of increase is slowed by cutbacks in automobile production. The Production Index is estimated at 192 for February, a gain of four points over the January peak.

Steelmakers are revising their estimates downward. Chicago cutbacks seem to be more serious than those in the Cleveland area, which has a heavy automotive market. Revision of automobile output has had no major effect as yet, but this situation could change at any moment.

A nearly balanced steel inventory situation coupled with signs of a downturn from Detroit, make for an uneasy situation.

The uneasiness is carried over to many segments of metalworking.

Drop forging plants in the Cleveland area, many of which are operating at a better rate than a year ago, still have a big question mark hanging over them. "You can have a great big backlog one day, and overnight it's slashed," said one forger. Spokesmen for the Drop Forging Association say that indications point to a 15 to 25% increase in business over last year.

Electrical machinery producers report good business. Total volume of business is expected to be the same as last year.

Reports from plastic molders present a spotty picture. One reports good business, at about the same level as last year, with expectations of a 10% increase for the year as a whole. Another, in the same area reports business down 20% from a year ago.

Welding shops show the same pattern. Shops with diversified customers arc working six days, plus overtime, in some cases. Small shops are on about the same work schedule as in 1959.

Most of the welders forecast a dip late in the second quarter, with total business for the year only slightly higher than last year.

The National Screw Machine Products Association forecasts a 10 to 15% fall-off in orders and a slight decrease in shipments for 1960. This seems to follow the cycle in this industry—a downturn, or levelling off, after an unusually good year, and 1959 was just that.

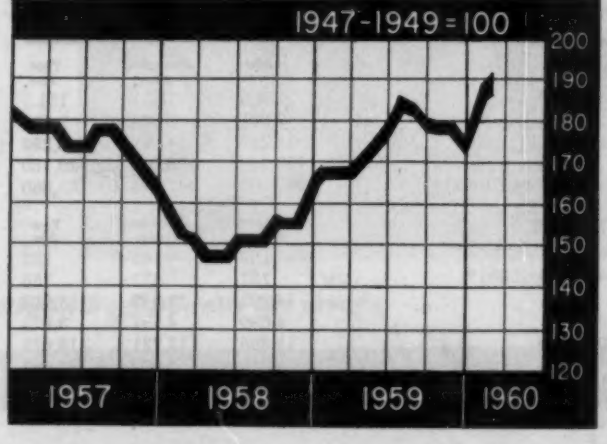
Latest monthly figures from the NTDMA show sales increases of 40% over a year ago. 1959 sales were up 18% from the previous year. Shops in the Chicago area report good conditions to date. Tool and die work on the West Coast is way down, and the outlook is not good. Change in complexion of work is the cause. About 5000 dies were needed for a plane, only 17 for a missile. Many shops are switching over to precision machining and prototype work.

Shipbuilding on the West Coast is down generally. No tankers are being built at all, and very little repair work is being done. Employment in San Francisco Bay area shipyards fell to 135,000 late in 1959, a drop of 7% from a year before, and is down considerably more by now.

Electronics firms on the Coast are expecting increased sales in all major categories, with military sales leading the way.

Orders for railway equipment are coming in even slower than expected, possibly in anticipation of a strike. This industry had hoped for a big year, but it has yet to materialize.

Sheet-metal fabricators are doing fairly well, with business expected to pick up in the spring with the increase in building and home construction.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	Feb. '60 Estimated	Jan. '60 Preliminary	Dec. '59 Revised	Jan. '59 Year Ago
Total Index	**192**	**188**	**184**	**166**
Machinery	154	157	131	
Electrical Machinery	241	231	199	
Autos	152	119	135	
Other Transportation	296	303	325	
Other Metalworking	162	156	143	

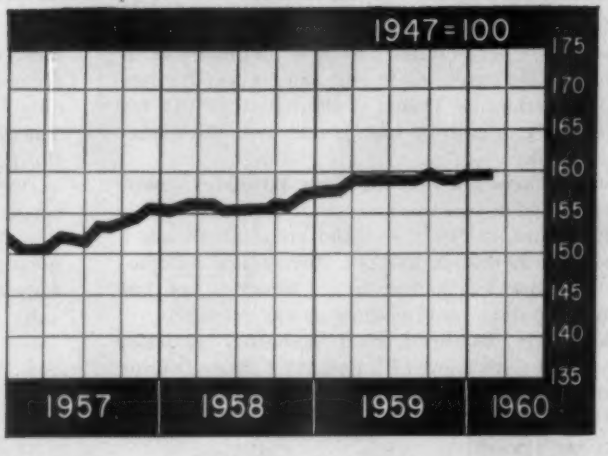
TRENDS

WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	FEB. Estimated	JAN. Preliminary	DEC. Revised	JAN. Year Ago
Total Index	**159.8**	**159.7**	**159.6**	**158.2**
Metalworking Machinery	...	**189.7**	**189.7**	**182.4**
Other Machinery exc. Electrical	.	**172.4**	**172.3**	**169.3**
Electrical Machinery	...	**162.3**	**162.1**	**158.9**
Fabricated Metal Products	.....	**148.1**	**148.1**	**148.6**

159.8



Industrial production registers new gains...

Industrial output made impressive gains in the first month of the new year. The index of industrial production climbed three points during January to a new record high at 112—12 points higher than in January 1959 (on the revised base, 1957=100). Total employment for the month was more than a million higher than in January 1959, and personal income was up.

Total personal income for January hit an annual rate of more than $393 billion, representing an increase of almost $25 billion over the mark for January of last year. It's pretty clear, therefore, that consumers do have the income required to keep sales growing.

Biggest gains in incomes have come for workers in manufacturing industries where recent wage rate increases and heavy production schedules have kept wage payments climbing. Average weekly earnings in manufacturing industries during January were $5 higher than a year ago.

It's difficult to understand the lag in auto sales in view of the steady rise in incomes. The University of Michigan consumer survey completed during the final weeks of the steel strike did indicate that consumers then were being cautious about their purchases. And that buying caution may be one reason for the sluggish start in auto sales.

Don't lose sight of the fact that the business outlook remains very good. Results in some areas have been disappointing. But solid gains are being chalked up in all sectors of the economy. Even in autos, sales in the early weeks of this year have run well ahead of last year's level.

And there are few ready forecasts of a business downturn in the months ahead. Evidence now indicates that most businessmen expect a sustained rate of gain in the months ahead, rather than a big boom followed by an early downturn. Such an impression was registered by manufacturers reporting in the latest McGraw-Hill new orders survey (see page 90).

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	158.9	159.1	151.1
Steel ingot operation (thousands of tons)	2,671	2,674	2,506
Electric power output (million Kilowatt hours)	14,226	14,071	13,259
Production of automobiles and trucks	153,186	158,723	120,780
Engineering construction awards (Eng. News-Record—millions)	307,762	342,243	285,660

MONTHLY BUSINESS INDICATORS	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	169	165	152
Index of durable manufactures production (1947-1949=100)*	181	172	156
Durable goods manufacturers' sales, millions*	14,992	13,479	13,613
Machinery manufacturers' sales, millions*	4,699	4,717	3,975
Durable goods manufacturers' new orders, millions	14,886	13,721	13,673
Machinery manufacturers' new orders, millions	4,846	4,673	4,047
**New Orders for Nonelectrical Machinery (1950=100)*	172	163	157
New Contracts for Industrial Construction (1950=100)	129	132	97

*Seasonally adjusted **New seasonal adjustment factors

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"AMERICAN" Hole Wizards Provide:

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3. ***Faster tapping through spindle reverse speed-up.***

The "Double Lo-Hung" Spindle Drive is an exclusive "AMERICAN" Hole Wizard feature. This drive divides the speed range into two separate ranges; the high speeds through a small gear to minimize gear velocities; the low speeds through a large gear to reduce gear tooth pressures under severe service.

This design in combination with its nitrided Spindle and Sleeve, Timken Mounted with outside adjustment for Spindle Bearings, guarantees maximum life, dependable operation and spindle stability for "AMERICAN" Hole Wizards unequalled by other designs.

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Road to Ruin

Look across the Atlantic and you will see an economic revolution in progress.

Western Europe is prosperous beyond its fondest hopes. People have money to spend and are buying things that until recently they could not afford. Industry is going full blast. And prospects are for more of the same, with further increases.

The rate of economic growth . . .

in Europe the next five years is put by some observers at five percent a year. In certain key areas, such as housing, the Common Market—consisting of Italy, West Germany, France, Belgium, the Netherlands and Luxembourg—offers a bigger opportunity than the United States.

Up until recently, automobile production in western Europe, including Britain, was only about two million units a year. Now it is around five million. And there is an excellent chance that before long it may surpass ours.

The lowering of tariff barriers within the Common Market opens up a market of 170 million people whose wants must be met. No longer can inefficient, high-cost manufacturers hide behind a protective governmental barrier. Who produces what will depend upon low costs and low selling prices. This means in turn that productivity in Europe is likely to rise more rapidly in the next five years than it has at any other time since World War I.

Hundreds of new plants . . .

equipped with modern machinery, plus a labor rate one-third ours, make almost an unbeatable combination. And that will be a precious asset to western Europe in the years ahead in the competition for world markets.

Suppose, after having looked over the European situation, you glance farther eastward to Moscow. You will see a performance even more spectacular. The Russians are out to match us economically as soon as possible and then to "bury" us. They have a long way to go. But who can say for sure they won't do it?

They are erecting new raw-materials facilities, building production equipment and adding to their capital and consumer goods capacity like mad. The Soviet leadership has thrown its full influence behind a gigantic program of creating new plants and modernizing old ones.

With such dedication of purpose, the Russians are bound to increase their productivity tremendously in the years ahead and to be in a superb position to go into world markets with low-cost, low-priced products. Of all indices, the one that the Russians follow the closest is the Productivity Index. The rate of economic growth and of the increase in productivity in Russia will be hard to surpass in the 1960s.

The natural question . . .

that follows this recital of western European and Russian achievements and prospects is: Just how do we measure up against such rugged competition? The answer is hardly reassuring.

Our rate of economic growth is considerably less than western Europe's or Russia's. Indications are that we will continue to lag the next five years. Available statistics show that our continued upturn in productivity will be less sharp than theirs.

Meanwhile the average age of production equipment in U S metalworking plants is rising rather than declining. The new production techniques that will make us more efficient are not being used. If the trend continues, there will be ample cause for alarm. Instead of becoming stronger competitively with western Europe and Russia, we will be weaker. Our position as the world's No. 1 economic power will be in grave jeopardy.

This is a problem so critical that the best talent in government and in industry should address itself to its satisfactory solution. Next to nothing is being done about it now. If it is to continue to suffer from neglect and indifference, there is no telling what the disastrous consequences will be for all of us.

Burnham Finney EDITOR

here's the really new

Cleveland Worm and Gear

SPEED REDUCER

It was Designed to Provide: High Horsepower in a Smaller Unit • Centrifugally Cast Bronze Gears • Alloy Steel Worms Heat Treated By An Exclusive Process for Carrying Higher Loads • Fan Cooling for More Efficient Operation • Maximum Overhung Load-Carrying Capacity • Ribbed Housing for Maximum Strength and Heat Dissipation • Modern, Streamlined Design to Enhance Your Machine's Appearance.

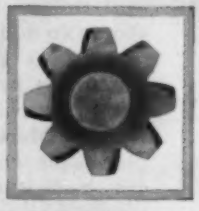
Cleveland's new speed reducer line meets AGMA Standard 440.03 — which permits higher horsepower and torque ratings — provides you speed reduction at savings of 50% or more on cost per horsepower. All this, with no deviation from Cleveland's standards of quality and dependability.

Remember, this strikingly new line of fan-cooled reducers — now available from one to forty horsepower — incorporates all the design knowledge gained by Cleveland's engineers over the past 47 years — plus all the advantages of modern metallurgical techniques and advanced manufacturing processes. Consult your Cleveland Representative for the complete story on this new speed reducer — or write us direct for Bulletin No. 405. It details input horsepower and output torque ratings, service factors, application and load classifications, as well as general over-all dimensions.

Cleveland Worm & Gear Division
Eaton Manufacturing Company
3254 East 80th Street • Cleveland 4, Ohio

CLEVELAND
Worm Gear
Speed Reducers

Check these new exclusive Cleveland features



Cleveland's Worm's, heat-treated by an exclusive process, possess a high degree of hardness throughout their entire thread thickness — and well below the worm's root diameter. This gives maximum thread strength and resistance to wear without losing the advantage of a tough core of medium hardness.

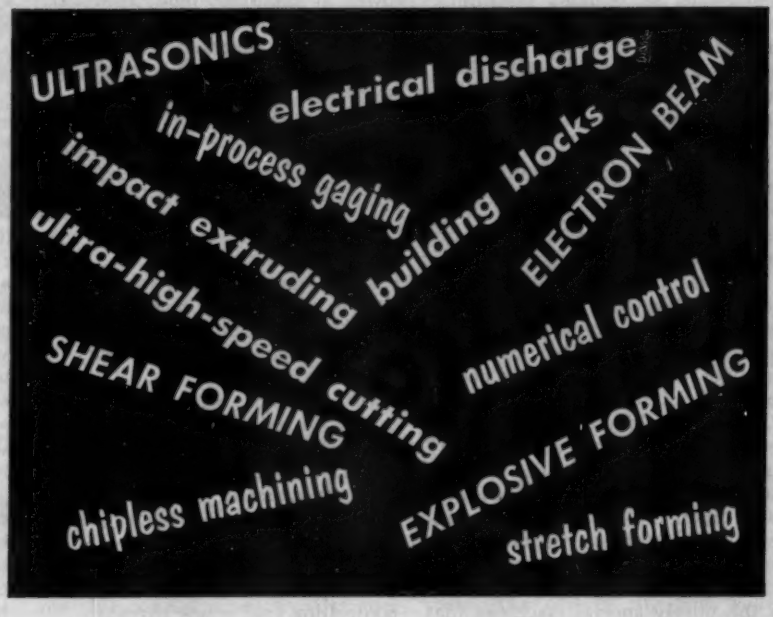
Centrifugal cast bronze rims have a greater density and a higher hardness, giving increased resistance to wear and fatigue pitting. They are centrifugally cast integral with cast iron centers on 6" and smaller sizes. This permits strong mechanical keying of the two parts — without dependence on actual surface bond. Gear shaft extension diameters are especially large to permit greatly increased overhung load capacity.

Worm and gear shaft bearings are Timken taper roller type, providing adequate thrust and radial capacity. Worm bearings are mounted directly in the housing bore for greater rigidity.

What has happened since the 1955 Machine Tool Exposition?

Trends in machine tool design

By J O Ellison, president
Harron Rickard & McCone Co
of Northern California, San Francisco



There is no doubt about it: Never before have research, invention and product development in the American machine tool industry advanced as rapidly as in the last five years.

The end products of those five years will be shown this September at the sixth Machine Tool Exposition in Chicago—more than a thousand machine tools operating under power. Presumably, all of them will have new features, and many of them will embody brand-new machining principles.

They are the builders' answers to what customers want, for contrary to popular opinion, new machine designs do not necessarily originate with the builders themselves. Customer demand is an inseparable part of the creation of new machine tools. Into them goes the sum of many individual customer requirements for performance, price and availability.

You can, then, expect to see two types of trends at the 1960 Exposition: (1) Improvements to existing machine tool concepts, and (2) machines based on new concepts in the art of metalworking.

The first of these, improvements to existing machine tools, is principally motivated by performance, economy, and lead time from order to delivery.

Performance is generally considered to be the prime reason for redesign of a machine tool. This, however, is not necessarily true. Even though a new design or a different approach might provide the means for producing a part substantially faster than existing machines, price and delivery must be considered, too.

Regardless of how productive a general purpose machine tool may be, if it is priced beyond the reach of the average user it is not going to be sold in sufficient quantities to permit its manufacture. This explains in part why you do not see too many dream tools introduced in this country without regard to price and availability.

When new and improved models of general-purpose machine tools are introduced (even though they offer tremendous advantages over the preceding model) the price is usually within 15% of the superseded machine.

Machine tool designs are, therefore, definitely limited to what industry is willing to pay for. This is the built-in economic factor in any machine.

Then there is the time factor. How easy to sell would a new super general-purpose machine tool be if it were quoted for, say, two years' delivery in a market where other machines in that category were available within 60 days?

Lead-time is important

In order to be continuously acceptable to industry in general, machine tools must be available on reasonably short notice. Even though the machine tool industry is cyclical by nature and deliveries are subject to some variables, a builder must avoid any design which would make his lead time longer than his competitors'.

That is why new models of general-purpose machine tools are usually not introduced until the builder's production setup insures a reasonable lead time. That is why, too, basic elements of a machine are not frequently changed.

Close relationship between customer demand and machine tool design in all of these areas is readily identifiable in the current popular concept of making a family of machine tools out of one basic design. This permits the builder to compromise on a machine that is the best possible combination of economy, availability and performance.

Therefore, when a builder uses many common elements in the production of a 13, 16, or 20-in. lathe (or a No. 3, a No. 4 or a No. 5 milling machine, or an 11, 13, 15 or 17-in.-column radial drill), he is obviously arranging his design and production techniques to meet customer demands for price and delivery. Conversely, if he designs purely for performance, prices and availability suffer.

This, however, applies only to such basic elements in a general purpose machine tool as beds, columns, headstocks, and larger castings. It does not apply to the arrangement of basic elements, nor to controls, tooling, in-process gaging, and the like. A great many modifications can be made on a machine to suit a particular customer's requirements. It is here that important progress is being made in machine tool design. In fact, Yankee ingenuity in this field has accelerated so much since the 1955 Machine Tool Show that many so-called general

purpose machine tools are now made up of building block units.

These changes are improvements in the existing art. But what about those based on new machining concepts? A number of new metalworking techniques such as chipless machining and explosive forming are being incorporated into new machine tools, many of which will be on display at the Machine Tool Exposition in Chicago next September.

These innovations are so fantastic, in fact, that there is strong indication that within five years industry will be able to handle what is now considered highly advanced work with semi-skilled operators.

Machines of this type will be displayed at Chicago in the field of chipless machining — including shear spinning, and electrical discharge machines that perform their operations without benefit of cutting tools.

At the Machine Tool Exposition next September, too, will be many outstanding examples of general-purpose or utility machine tools based upon the building block concept. Many of these machine tools, incorporating greatly extended productivity, will be priced very close to the purely special machines that were manufactured and sold for similar job applications 10 years ago.

Since new controls and in-process gaging are the most widely publicized approach to improving general-purpose and utility machine tools, most visitors in attendance at the 1960 Exposition will be looking for new applications of numerical controls.

Certainly, there will be much of this equipment on display and under power at the Exposition. However, much will be missed by anyone who fails to look beyond the numerical control cabinets and control consoles. Design changes in machine tools to make them more suitable for numerical controls or in-process gaging will be equally significant.

New design trends

Look also for these trends in machine tool design.

- More efficient means for controlling or dissipating heat which is sometimes created by a machine tool to such a degree that accuracy or alignment is affected.
- Heavier beds, columns and headstocks—to minimize the deflection that cannot always be compensated for in the programming of tape.
- Large diameter pall screws and anti-friction nuts in place of conventional screw design.
- New emphasis on large-diameter, precision anti-friction bearings for controlling feed screw thrust.
- Sliding way bearing designs incorporating serrated ways or pressure-controlled oil film to reduce or eliminate the stick-slip factor. Simple improvements in controlling stick slip could mean that a slide would move in increments of millionths instead of tenths—thus improving the accuracy characteristics of a machine tool several fold without having changed the outward appearance of it one iota.
- Mechanical and control components designed with service or maintenance in mind, which will definitely reflect customer demand for machine tools that can be maintained by existing personnel.
- Super-precision machine tool designs based upon a completely different family of precision equipment for verifying accuracy, both at the time of building the machine and as a continuing requirement by the user.
- More general use of precision hardened and ground ways. Nonmetallic covers over ways, screws and other vital components will protect them from chips, coolant and other contaminates.
- Machine tools with controls so sophisticated that it will take far less time to orient a new operator.

In short, look for many new individual design concepts, which combined will represent the greatest strides in productivity and tolerance control in any five-year period in the history of the machine tool industry.

Don't look for some one magic gimmick which by itself elevates machining techniques to new perimeters —because in so doing you would be missing many really basic improvements in machine tool design.

Machinery orders to reach peak in third quarter

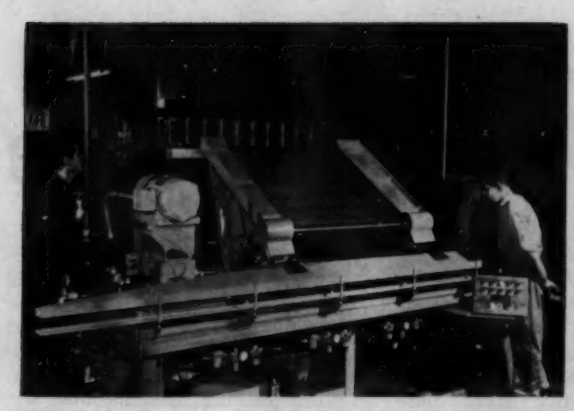
Total Machinery

1959	Unadjusted	Seasonally adjusted**	Pumps & compressors	Engines & turbines	Construction & mining mach.	Metalworking machinery	Other Ind. machinery	Office machinery
I Q	176	168	233	197	196	150	163	196
II Q	185	177	252	208	215	190	164	197
III Q	162	178	207	182	193	172	143	166
IV Q	156	156	230	162	168	182	156	195
1960								
I Q*	170	162	278	184	201	225	174	190
II Q*	183	178	322	207	220	221	187	208
III Q*	175	183	307	201	206	188	179	216
IV Q*	173	178	293	198	203	199	177	239

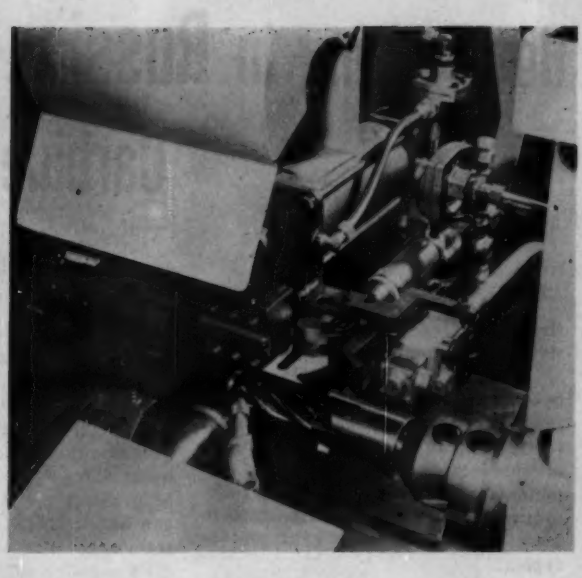
*Forecast made in mid-January 1960. **New seasonal adjustment factors beginning with 1960 (1950 = 100)

Most machinery producers, when queried during 1958, said they expected the peak of new business near the end of 1959 or early in 1960. Then came the steel strike. The outlook now, as shown in the latest Machinery New Orders Forecast compiled by McGraw-Hill's Dept of Economics, is for new incoming orders to reach their peak in the third quarter of 1960.

This shift means we can expect a stretching out of the current upswing in capital expenditures. Orders should taper off slightly in the last quarter, says the forecast, but dollar volume of new business will be slightly higher than in 1959.



Plant-designed unit machines both ends of a spool mandrel automatically at the same time, takes just 0.73 min to do the job, contrasted with 8.2 min for turret lathes



Close-up of Morse-designed tool after it has finished shouldering and finishing one end of mandrel

Single machine replaces battery of turret lathes, cuts cost 91% . . .

One-shot machining of mandrels

One machine has uncorked a production bottleneck so well at American Air Filter Co's Louisville plant that a tricky machining job is now being done 11 times faster and 91% cheaper than with part-time use of a battery of turret lathes.

The company's new Model B air filter incorporates a disposable glass fiber filtering element which is rolled between two spool mandrels. Every time the filter element is replaced, a new spool mandrel is needed.

Model B sales were so brisk that demand for new mandrels became continuous, and turret lathes had to be pulled off regular production with increasing frequency to machine the mandrel ends. As a result, AAF had to subcontract out more and more turret work to fill the production gap.

The problem was tossed into the lap of industrial engineer Robert Crone, who with the help of a new specially designed Morse Twist Drill cutting tool came up with a single automatically operated machine to take the place of the turret lathes, and the many manual operations that went with them.

Machining time per mandrel has been cut from 8.2 minutes to 0.73 minutes. Feeding and positioning the part, clamping it and rejecting it takes 12 seconds, and machining about 32 seconds.

The machine itself has a bed onto which raw welded pipe is positioned and clamped automatically. Uprights on either end contain standard milling heads with locked-in Morse cutting tools that work both pipe ends at once. The tools (1) clean welding bead from the pipe ends and widen undersized IDs, (2) bore the interior of both ends of pipe to specified diameter and depth, (3) turn outside diameters, and (4) cut and face shoulders to hairline tolerances.

Under the old turret lathe setup, each of these jobs had to be done separately on one pipe end at a time.

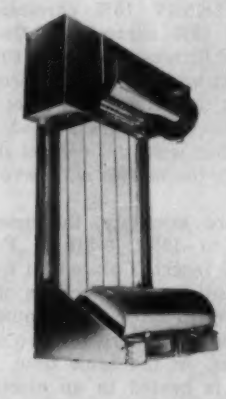
Automatic controls

The new machine automatically ejects the mandrel when machining is completed, and an automatic safety device shuts the machine off if anything goes wrong. An air-hydraulic mechanism controls feed of heads, and overall dimensions are electrically controlled.

Actually, after mandrel pipe has been stack-sawed and fed manually into a hopper, which in turn feeds pipe into the machine, the whole operation is performed at the pressing of a button.

Cutting tools developed for the AAF machine by Morse engineer Edward Rolnick, do more than is called for in the way of tolerances: The spool mandrels require tolerances of only ±0.005 in., but the new process is achieving tolerances from –0 to +0.001 in. with no increase in costs. And cost of the new Morse tool is just about the same as the cost of tools needed with a turret lathe.

AAF's new machine is now being fitted with other special Morse tools. Object: automatic spotfacing and shafting for the Model B Roll-O-Matic air filter, and certain other small shafts. Estimated additional savings from this new development: as much as $4500 a year.



Mandrels have to be changed every time moving roll material is renewed on this Roll-O-Matic air filter. Filter operates much like a player piano roll—air comes through the glass fiber curtain which rolls at command of an automatic time switch to insure constantly clean filters

Hot Forging in Russia...

Carbide inserts increase die life

By A V Pakhomov*

Hot forging, one of the most progressive and economical methods of metal forming by pressing, is widely used in the Soviet automobile and farm-machinery industries. Manufacturing cost of forged components is considerably less than that of components made by other pressing techniques. But die life is short—2500 to 3500 components, for example, is typical.

Recently designed dies, fitted with Soviet VK15 cemented-carbide inserts, are now producing right- and left-hand stub axles (Fig. 1) as well as valves (Fig. 2) for car and tractor engines. This article describes a method of machining these dies, by spark-machining and hydro-polishing their surfaces, that replaces the usual time-consuming fitting operations.

This article also deals with a method of assembling the cemented-carbide inserts in hot forging dies, to insure the most reliable assembly and operation. Fitting these inserts into a die with usual pressing techniques is not reliable, because the cemented carbide and the die materials have different coefficients of expansion. To assemble VK15 cemented-carbide inserts in Soviet steels 5KhNV (5% chromium) or 3KhV8 (3% chromium), the interference fit must be from 180 to 280 microns, which is two or three times greater than the interference fit recommended for press-fitted assemblies. But with the correct interference fit, the inserts will have a long life.

Before assembly, the inserts are cooled to –195 C (–318 F). For cooling the insert is placed, in its working position, at the bottom of a covered vessel filled with liquid nitrogen and held there for two or three minutes. At the same time, the die metal is heated in an electric furnace, until its working surfaces reach a temperature of 300 C (572 F). To assemble the parts, once they are prepared, only slight tapping is necessary.

Stub-axle dies

A front stub axle (Fig. 1) is a complicated part. Forging dies (5% chromium steel) that make these parts had a life that did not exceed 3500 components. In practice, maximum die wear occurs at the points of greatest metal flow. But die life can be increased, investigations have shown, by increasing the life of the die's working surface at these points. That is why carbide inserts are placed in the throat area of roughing and finishing dies. With the conical insert, press-fitted in the assembly, die life increases to from 8000 to 10,000 parts.

With this increase in die life, it was found advisable to standardize the dies for right- and left-hand axles. As a result, the number of resets in forging operations is lowered. This standardization made necessary certain changes in axle design, and the addition of a minor machining operation. But it also resulted in simplified construction of dies, and flow of metal into the die cavity for boss was eased. Machining the flow cavity on the die-sinking machine was also easier to accomplish.

Carbide inserts also increased life of dies that make engine valves (Fig. 2). Before use of the inserts, valves were forged in two passes to save die wear. The inserts made it possible to forge the valves in one pass, and tool life was increased by 6 to 8 times.

Preparation of dies

Preliminary machining of dies is carried out on a Model LKZ-19 spark-erosion machine. There are two passes, rough and finish, and the electrode is grey cast iron. The working cavity of the die is finished by lapping with cast-iron laps and boron-carbide pastes, which give a good surface finish and dimensional accuracy. Dimensional inspection during production is accomplished with templets.

Spark-machining carbide inserts with the above spark-erosion machine has one disadvantage: Electrode wear is considerable. For this reason it is not economical to machine stub-axle dies, of complicated form, that have carbide inserts. Another machine, Model 473 spark-impulse piercing machine, does the machining of these carbide-insert dies. Tests have shown that spark-impulse machine reduces electrode wear by as much as twenty times.

[NOTE: The basic difference between these two Soviet machines is apparently in their circuits. The spark-erosion machine evidently employs a *relaxation* circuit, which produces high-energy sparks at low frequencies, with considerable electrode wear. The spark-impulse machine, on the other hand, has a *pulse* circuit that removes metal with a lower-energy-level spark; hence electrode wear is less. For a discussion of these two basic types of spark-machine circuits, see *AM*—Aug 24, '59, p 90-92—Ed]

The spark-impulse machine does the preliminary machining. The dies are finished by hydropolishing, which gives a high-quality surface finish together with high wear resistance of the working surfaces. See Fig. 3 for this setup.

For the machining operation, a die with the carbide insert is secured to the table of the electro-impulse machine. Then the electrode is fixed in the spindle head and positioned relative to the die with a superimposed templet. The electrodes are aluminum, heated and forged in a cold, unused forging die. After the flashes are removed, the cold forging is calibrated in a sizing die.

Hydropolishing

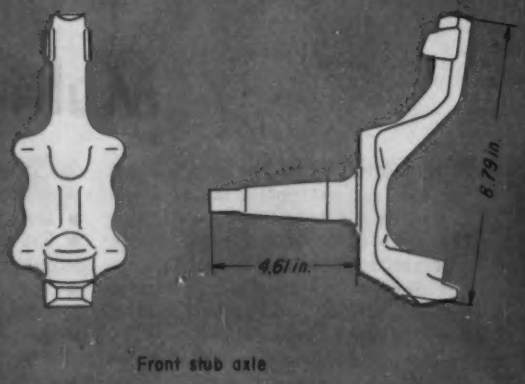
Hydropolishing of the flow cavities is carried out by subjecting the working surfaces to a high-speed stream of liquid (abrasive suspension). (See Fig. 3.) The productivity ratio of the process, as well as the quality of surface finish, can be altered by changing the speed and size of the abrasive particles, the distance of the nozzle from the machined surface, and the angle of impact.

*Adapted from the Russian magazine *Stanki i Instrument* (*Machines and Tooling*), Vol. 30, Issue No. 2, 1959

Fig. 1—Front stub axles for Russian autos are forged in this die, which is fitted with cemented-carbide inserts that increase die life 4 to 5 times

Fig. 2—Engine valves are also hot-forged in dies fitted with carbide inserts. These dies are machined on a spark-impulse unit, then finish-machined by hydropolishing in an abrasive liquid

Fig 3—Hydropolishing process finishes dies machined by spark-erosion units. Process reportedly reduces machining time, also cuts labor costs



Front stub axle

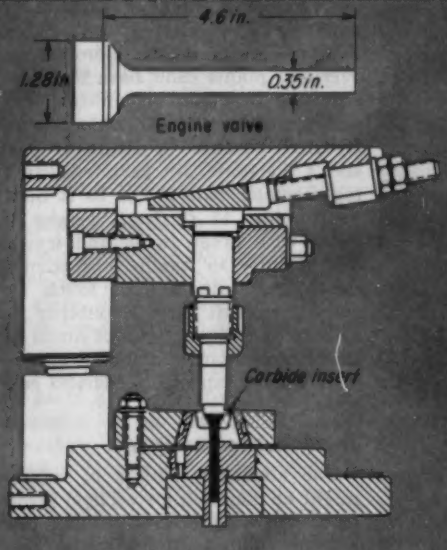
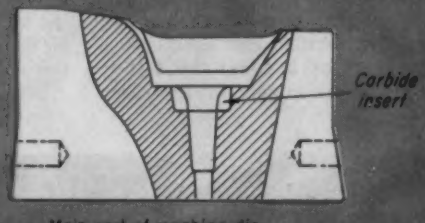
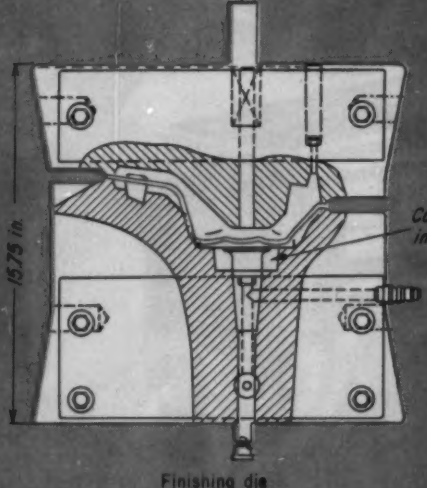


Fig. 2



Main part of roughing die



Finishing die

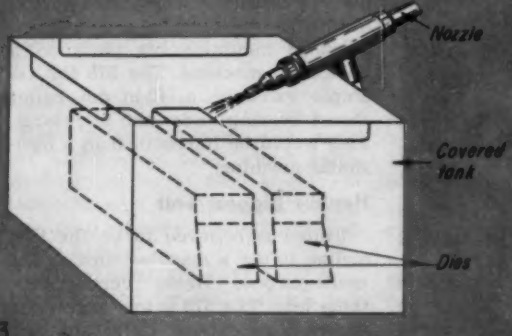


Fig. 3

Fig. 1

Here is the recommended content of the liquid:

Water: 11 gal

Boron carbide (grain 80 to 120): 44 lb

Calcined soda: 0.441 lb

Sodium nitrite: 1.654 to 2.205 lb

This liquid is delivered at 6 to 7 atmospheres (88 to 103 psi). Consumption of compressed air for one nozzle is from approximately 3500 to 7000 cu ft an hour. Pressure in the compressed air system is 3 to 7 atmospheres (44 to 102 psi). One nozzle consumes 2 to 4 liters a minute (0.441 to 0.882 gal/min).

Under the above conditions, the depth of the removed metal layer varies from 0.01 to 0.03 mm (0.0004 to 0.0012 in.).

Tests have shown that hydropolishing at 4 to 7 atmospheres, with 18-micron boron-carbide grains, changes the height of micro-irregularities from 15-20 microns to 2-10 microns. The surface finish obtained corresponds to a 7-to-9 class of surface finish (equivalent to 1.6—0.2 microns rms). Hydropolishing reduces length of machining up to five times, and lowers costs about two times, compared to hand finishing.

The setup for hydropolishing dies consists of a covered tank with inspection ports. The dies are positioned in the tank and the stream of abrasive liquid is directed to the working area by nozzle.

Dies with carbide inserts, made by progressive techniques, increase die life 4 to 5 times. Labor is reduced, and cost savings are considerable.

Multi-purpose machine tool

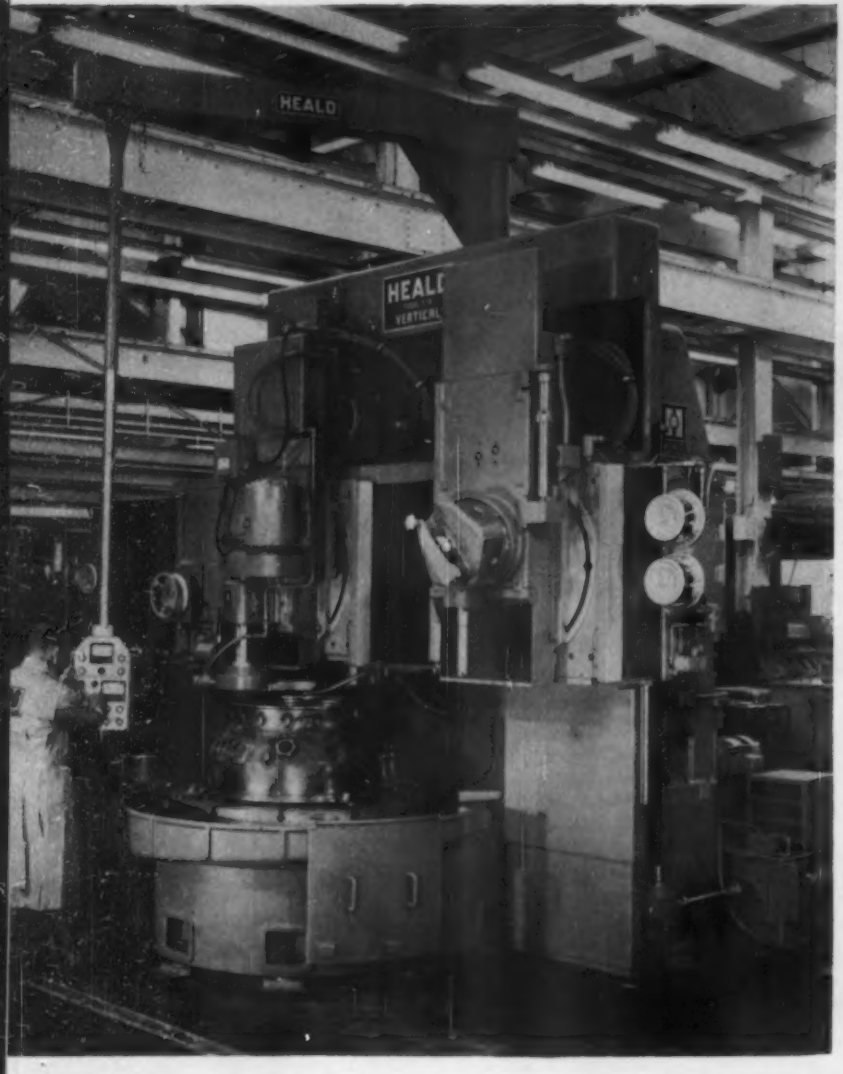
A revolution in jet engine overhaul methods and concepts is taking place at United Air Lines' new South San Francisco maintenance base, where a single machine tool is performing a wide variety of grinding, boring, facing, turning and other metalworking operations.

"It's industry's answer to the demands of jet age travel for the equivalent of longer runways in the maintenance shop," United officials say.

Almost but not quite in the "elephant tool" class, United's big new Heald 578 vertical can handle such large parts as 2-ft-high by 2-ft-diameter turbine engine diffuser cases, and it's versatile enough to do such jobs as:

- Grinding tips of rotor blades.
- Turning IDs and shoulders of aluminum rings and stator blades.
- Turning and grinding steel diffuser case joints.
- Grinding bearing seats on shafts and in rotor shaft bores.
- Grinding planimeter rings for checking the shape of sheetmetal sound suppressors, and such other toolroom jobs as grinding holding fixtures on the machine, and grinding tips of bushings in a ring jig for locating 80 ventilation holes inside the diffuser casing.

Some idea of the complexity of jobs that United's new vertical must perform may be gotten from the fact that very few of the DC-8's 50,000-or-so parts are identical with those in previous airliners. The 578 is actually engaged in jet "remanufacture," a process that differs sharply from overhaul practices for piston engines.



Size of the components alone calls for flexible equipment capable of handling a variety of operations with minimum setups. Commercial overhaul plants can't base their operational methods on military experience or on original engine manufacture because conditions just aren't the same. Jet parts require a big machine (the 578 is 15 ft high, 15 ft wide, 12 ft deep, weighs 25 tons) with great swing and travel, and rigidity to handle big components, but with a light touch for smaller aircraft parts. Flexibility for machining several types of metal on the same equipment demands greater versatility in speeds, feeds and controls.

There *is* another way

The alternate method of rebuild might be done with a vertical grinder or gap type internal grinder plus a lathe—both with horizontal spindles. Because the work must rotate, mechanical problems are encountered in mounting big parts on a horizontal machine. The 578 for example can use a 40-in.-dia roller thrust bearing under the worktable. This would be impractical in a horizontal machine.

Heald's biggest unit

United is believed to be the first airline to use a machine such as the multi-purpose Heald vertical for these jobs. The 578 is the largest single unit ever built by Heald, and certainly it is the most completely universal.

Its 10-ton slide assembly incorporates both a grinding head and a metalcutting turret. The five-position turret (primarily for roughing) holds five single-point tools for boring, facing, turning, and for performing associated operations.

Grinding head operations

The grinding head does such finishing operations as internal, face, external and rotary grinding. Each head can be positioned separately—vertically on slides, and horizontally along a cross rail. Worktable accom-

keeps United's jets flying

modates pieces up to 52 inches in diameter, and up to 48 inches high—so that 4-foot-long shafts may be ground.

Table speeds range from 2½ to 180 rpm. Slides reciprocate either manually or automatically at a rate of 0 to 10 fpm. Both the cutting and grinding turrets have 20-inch travel, can swivel 45 degrees to either side of vertical for angular operations.

Speeds and feeds, infinitely variable, can be remotely controlled from a pendant while the machine is operating. Operator can raise or lower the pendant 24 inches and swivel it to any advantageous position, even to the rear of the machine.

Machining sequence

When the Pratt & Whitney engines which power the DC-8 Jet Mainliners enter the turbine overhaul and test sections at the 128-acre base they are stripped to individual components for preliminary cleaning. Such big parts as the diffuser cases are suspended on an overhead conveyor system for the hours-long trip through various solvents. After inspection, the stainless steel cases move to the Heald vertical for boring and turning operations. Carbide tools are held in the turret by ram type holders. Cimcool coolant circulates at 20 gallons per minute at 30 psi.

Finishing operations

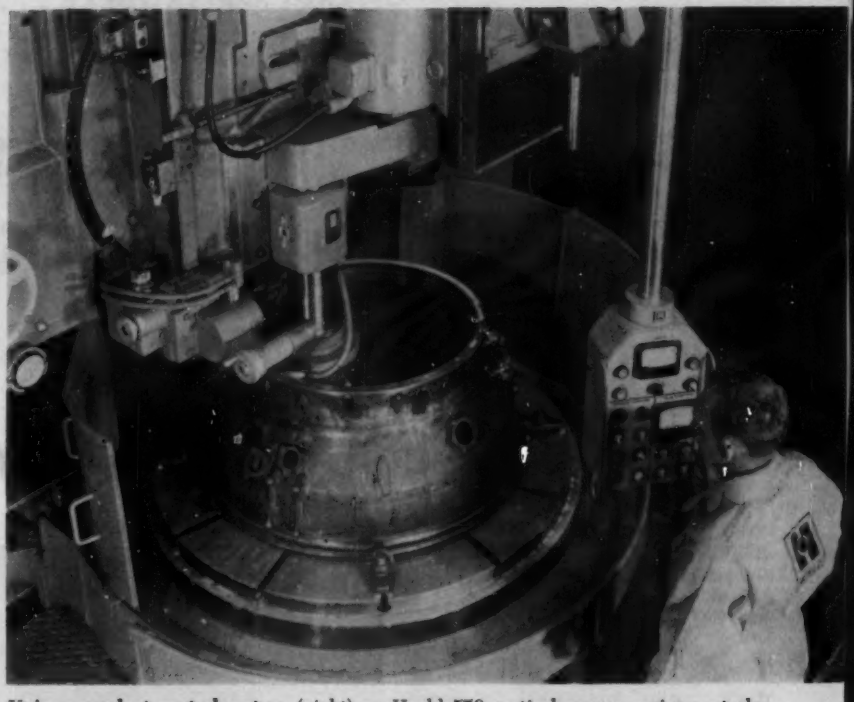
Chrome plating levels the worn and pitted areas, after which finish grinding (at up to 6000 sfpm) restores the part to dimension within a required tolerance of 0.0003-in. and 15 rms finish.

Diffuser cases are held with four chuck jaws on the table. Rotor and stator rings are clamped on the table with hold-down clamps between sheets of ¼-in.-thick rubber centered on a steel stud to prevent distortion during grinding.

Control system

For efficient operation, major controls are grouped into three sectors on the panel. Infrequently used controls are on a column side panel.

Table controls (start, stop, jog, speed control and speed meter) are at the top. The lower left corner of the pendant controls grinding, and includes a dresser switch, a coolant switch, wheelhead start-and-stop buttons and vertical and horizontal direction and speed controls. The lower right section of the pendant controls cutting, including rapid traverse or feed selection, plus horizontal and vertical positioning. An emergency control rod at the bottom of the pendant stops all machine functions.



Unique pendant control system (right) on Heald 578 vertical groups major controls into three sectors: for table (at top), grinding (lower left), and cutting (lower right). Infrequently used controls are on a column side panel. Emergency control rod at bottom of panel stops all machine functions

The system is unique in that speeds are controlled hydraulically from a remote position by electrically actuated throttles. Electro-hydraulic reversal of the grinding slide is effected without mechanical linkages by transistorized proximity limit controls developed by the tool builder.

This system avoids the necessity for a mechanical linkage from the dog to reverse valves high up on the slide, which would have made the slide assembly large and cumbersome. Direct-current-actuated valves of Heald design save space and speed operations.

The transistorized control also serves to soften reversal strokes electrically. This prevents inducing shocks (which would affect finish) into the machine structure. A remote control dwell at either end of the grinding stroke brings slowly rotating large-diameter work to size without secondary grinding. Tarry or dwell of 1/3 to 20 seconds at top and bottom can also be set independently if necessary.

A barrel stop on the cutting slide is geared to the turret for a feed depth control. When the turret indexes, the barrel also indexes so that each tool in the compound stops at the same hole depth, regardless of tool length.

Accuracy plus Speed

Even with the rigid maintenance requirements United prescribes, the 40 Douglas DC-8s and 18 Boeing 720s which will comprise the Jet Mainliner fleet will be out of operation only a minimum time for engine overhaul. The operational methods and techniques in United's new jet overhaul program will help keep the high-cost giants of passenger travel tuned to high efficiency and in the air earning their keep.

CAUSES OF TROUBLE . . .

- Tap size decreases and/or the thread becomes coarser.
- Percentage of thread height increases.
- Chips become increasingly stringy.
- Depth of tapped hole increases.
- Distance decreases between end of tapped thread and bottom of drilled hole.
- Tapping speed increases.
- Strength and hardness of material to be tapped increases.
- Cutting fluid becomes less efficient, either in quality, application, or volume.
- Work material increases tendency to load or gall.
- Structure of prepared hole varies in surface condition and accuracy.

BLIND-HOLE TAPPING can be painless!

By John W Turton,
Greenfield Tap & Die Division,
United Greenfield Corp,
Greenfield, Mass

Tapping blind holes is one of today's major metalworking headaches, and the adage "an ounce of prevention is worth a pound of cure" certainly holds true here—if at all possible, blind holes should be eliminated at the design stage.

But if they can't be avoided in design, and you're stuck with the job of putting threads in blind holes, here are a few basic trouble-eliminating rules of thumb, along with some charts to help you steer a safe course.

For instance, you should:

- Select the coarsest practicable pitch relative to hole diameter.
- Take specific steps to avoid or remove stringy chips.
- Try to get more clearance between the end of the thread and the bottom of the hole.
- Control torque more closely when using high-strength materials.
- Be sure that machines and tapping attachments are delivering all the power that is needed at the tap.
- Pay close attention to percentage of thread depth.

Even in the actual manufacturing stage, it is still possible to take corrective steps to improve tapping conditions. For example, when stringy material requires considerable threading, it is sometimes advisable to heat treat it to a somewhat higher hardness before machining. Or, another example, torque can be reduced by using surface-treated taps and/or lubricating coolants.

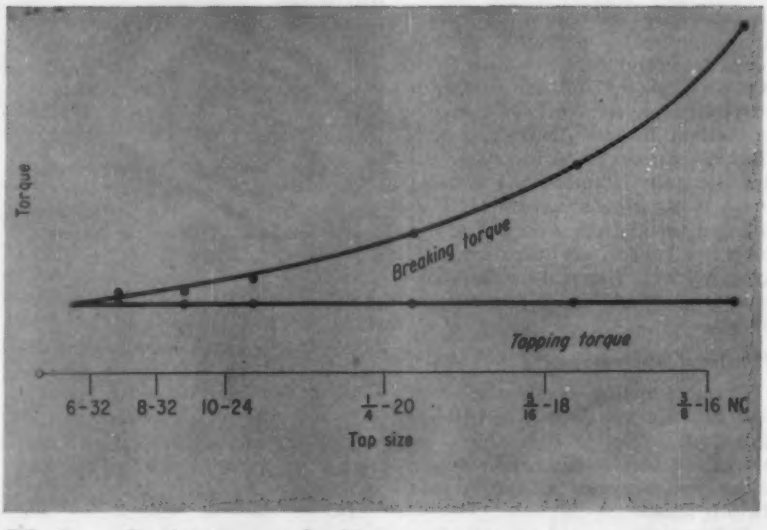


FIG. 1 . . . Tapping torque vs breaking torque

Ten basic factors must be taken into consideration in tapping of blind holes. They are:

1 . . . Tap size and thread pitch

The smaller a tap is, the more easily it breaks, because tap strength varies almost directly as the cube of its core diameter. For example, a tap with a core diameter of 0.200 in. has eight times the strength of an 0.100-in.-core-diameter tap. If such factors as material, hardness and length are equal, it would thus take eight times as much effort to break the first tap as the second one.

It is true that smaller taps with finer pitches are easier to work with, but aside from their tendency to break more easily than larger ones, they also remove less material, and they have less flute space for collecting chips. In other words, the smaller the tap, the smaller the safety factor between available chip space and the volume of chips that is packed into that space.

A certain amount of effort is required to push stringy chips into the flute space, and to more or less make them conform to the space. As the volume of chips packed into

. . . AND SOME CURES

- Carefully prepare the holes to be tapped. Use the right drills for the material, and keep them sharp.
- Use plenty of cutting fluid while drilling and tapping.
- Use as low a percentage of thread height, and as short a thread length as is consistent with maintaining strength of assembly.
- Use gun taps wherever possible in materials that give long, stringy chips.
- Use as fine a thread pitch and as large a diameter as possible.
- Try surface-treated taps to combat loading.
- Use the lowest practicable tapping speed.
- If trouble persists in spite of these precautions, consider designed-for-the-job taps.

the flutes increases, more torque is needed to push them around.

Recommenation: If possible use a finer-pitch tap, because it (a) requires a lower tapping torque (Fig. 2), (b) removes a smaller volume of thinner, and more manageable, chips and provides more chip space (Fig. 3—note that the flute space available for chips is that space below the minor diameter of the product), (c) requires a slightly higher breaking torque.

2 . . . Percentage of thread

Flute space for chip collection becomes smaller as the percentage of thread being tapped is increased, and the volume of chips being cut is also increased. Because more material is thus removed, and there is less space to contain it, tapping torque is increased.

Fig. 4 shows the available chip space in a ¼-20 NC, four flute hand tap when tapping 100%, 85%, 75%, and 60% thread. An interesting comparison is shown in Fig. 5: A 60% thread requires only 42½% of the tapping torque required by a 100% thread. The solution here is to use the minimum percentage thread height possible to satisfy engineering requirements.

3 . . . Stringy chips

Unfortunately, all materials when tapped do not produce convenient powdery chips (like those produced in tapping cast iron), which pack into comparatively little space. Long, stringy chips that pack into the flutes are often encountered in present day tapping problems.

Disposal of chips by either pushing them ahead of the tap or pulling them up the flutes would be ideal. Gun taps deflect the chips so that they curl out and ahead of the tap. However, the length of the drilled hole should be at least twice as long as the full thread required to leave sufficient space at the bottom of the hole for chip accumulation (Fig. 7). Chips are "helped" out of the flutes by the action of a spiral-fluted tap. This design allows tapping very close to the bottom of the hole, and eliminates danger of the chips clogging in the flutes. A third solution is to use tap cartridges—wax pellets placed in the hole before tapping. These pellets push low-strength

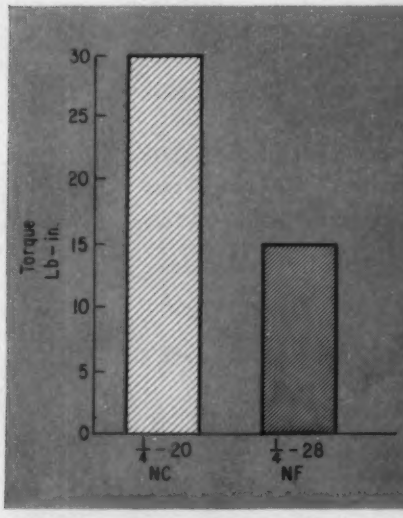


FIG. 2 . . . Comparative torque. (¼ – 20 N C vs ¼ – 28 N F)

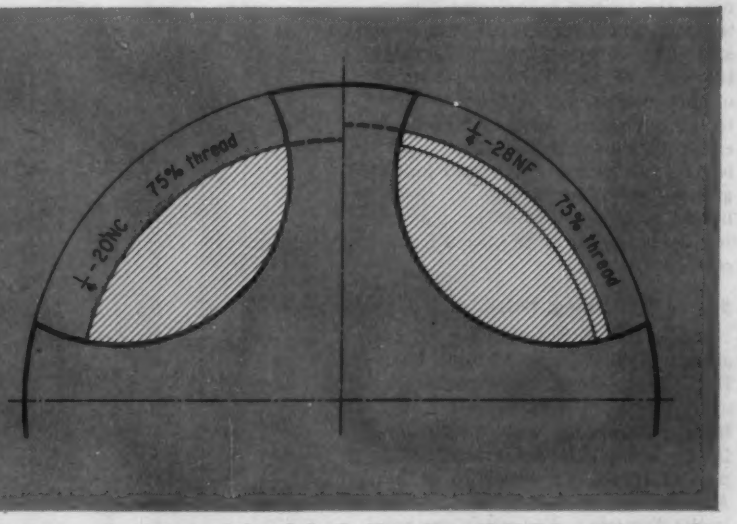


FIG. 3 . . . Percentage of thread depth. Note: ¼ – 28 N F has 18% more chip space available than ¼ – 20 N C. Into this larger space is packed only 70% of the total volume of chips removed by the ¼ – 20 N C. And the tapping torque for ¼ – 28 N F is only 50% of that for ¼ – 20 N C

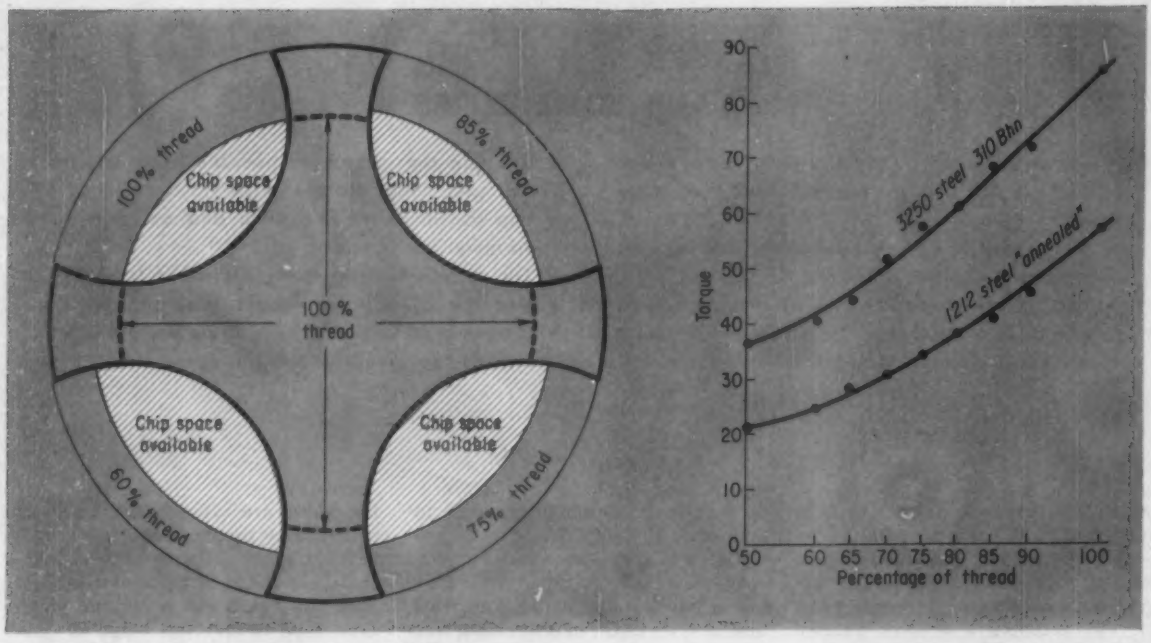


FIG. 4 . . . Percentage of thread vs available chip space—¼ – 20 N C, 4-flute hand tap. (85% thread gives 22% more chip space than 100% thread, 75% thread gives 33% more chip space than 100% thread, 60% thread gives 61% more chip space than 100% thread).

FIG. 5 . . . Torque vs percentage of thread — ⅜ – 16 N C plug gun tap SH-47, tap speed: 600 rpm, sulphur-base oil

chips out of the hole, but they are not recommended for materials that produce high-strength chips.

4 . . . Length of thread to be tapped

Several articles have been published in recent years dealing with the strength of threaded assemblies. These articles show that maximum strength is reached, in most cases, when the tapped hole is one diameter deep and tapped to between 55% and 65% thread height. Longer threads not only require removal of more chips, but add no strength to the assembly. To avoid the higher torque caused by increased thread length, use as short a thread length and as low a percentage of thread height as is possible without affecting the strength of the threaded assembly.

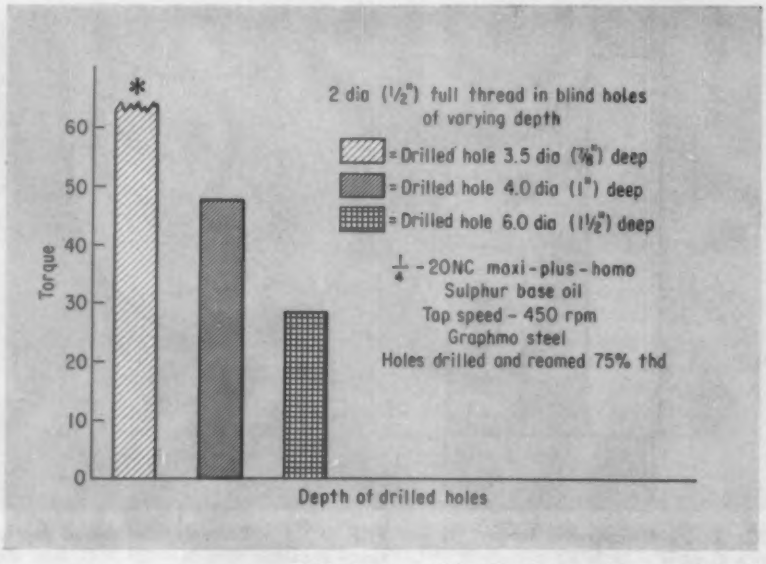
5 . . . Bottoming holes

Too often it is necessary to tap almost to the bottom of blind holes. If the chips are stringy, special care must be taken to keep them from falling to the bottom of the hole. If the tap is allowed to bottom on packed chips, it is likely to shatter. All of the chips must be contained in the flutes or pulled out of the hole.

Care also must be taken to insure that all drilled holes are the same depth and that the taps are carefully positioned in the tap drivers. The stop depth must be accurately set, otherwise the taps may strike the bottom of the hole and break. If at all possible, design engineers should allow sufficient room at the bottom of a hole so that the problems of tapping it may be minimized.

6 . . . Strength of materials

The higher the strength of the work material, the more important it is to increase the difference between tapping torque and breaking torque, because higher strength materials require higher tapping torques. Difficulty of tapping high-


*
2 dia (1½") full thread in blind holes of varying depth
= Drilled hole 3.5 dia (⅞") deep
= Drilled hole 4.0 dia (1") deep
= Drilled hole 6.0 dia (1½") deep
¼ - 20NC maxi-plus-homo
Sulphur base oil
Tap speed - 450 rpm
Graphmo steel
Holes drilled and reamed 75% thd
Torque
Depth of drilled holes
0 10 20 30 40 50 60

*This torque was higher than the recording pen would handle

FIG. 6 . . . Torque of gun tap.

strength materials may be eased somewhat by reducing the percentage of thread, decreasing the length of thread, increasing the length of drilled hole, using finer pitch taps.

To a great extent, strength (ultimate tensile strength) and hardness go hand in hand. Many times, general-purpose taps with slight modifications or special surface treatments may be the answer to tapping medium-hard materials. For materials with high hardness, taps made especially for the material and its condition are recommended.

7 . . . Tapping speed

Blind-hole tapping speeds must be lowered as the length of hole increases, because in long holes accumulated chips interfere with lubrication.

8 . . . Cutting fluid

Cutting fluid for blind-hole tapping must be the best available; because the fluid tends to create a static pool in the hole, while fresh fluid runs in and almost directly out of the top of the hole. A properly applied, efficient cutting fluid also reduces the tendency for the tap to load or gall. Fig. 9 shows the comparative torque required to tap 75% thread in a material that produces stringy chips, using various fluids.

9 . . . Loading

Loading may be defined as welding of work material to the cutting tool, either as "built-up cutting edges" or (on the flanks of the tool) as galling or smearing. Along with these tendencies to load, it is usual to find poor surface finish, because portions of the load slough off the tool and deposit on the work surface. Other bad loading effects: increased torque, torn product threads, tendency of the tap to cut oversize.

Various tap surface treatments and efficient cutting fluids can reduce the effects of loading. These surface treatments form deliberately contaminated surfaces on the tap to which the material will not weld.

10 . . . Condition of the hole

It is obvious that out-of-round holes, holes that are not straight, holes that are glazed because of a dull drill, and cored holes with variations in size cause difficulties in tapping. It is essential in blind-hole tapping—even more than in through-hole tapping—that good, clean holes be drilled and accuracy maintained so as to lower the strains on a tap.

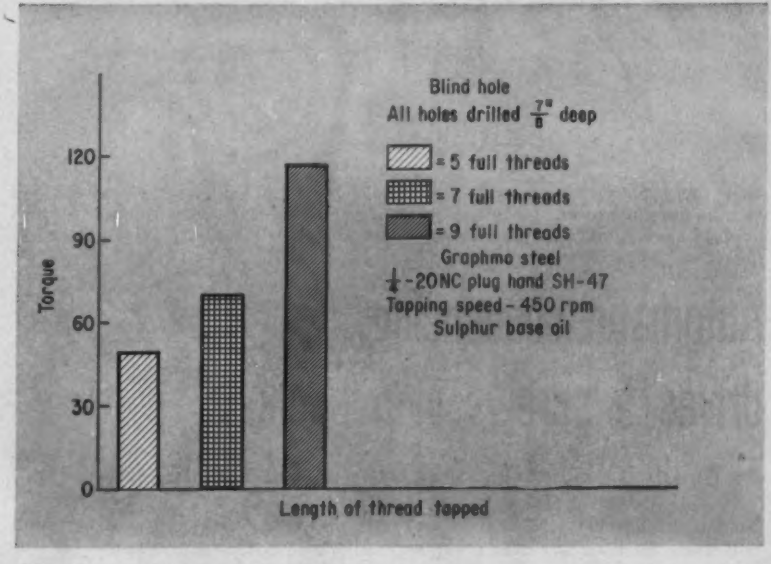


FIG. 7 . . . Torque vs thread length

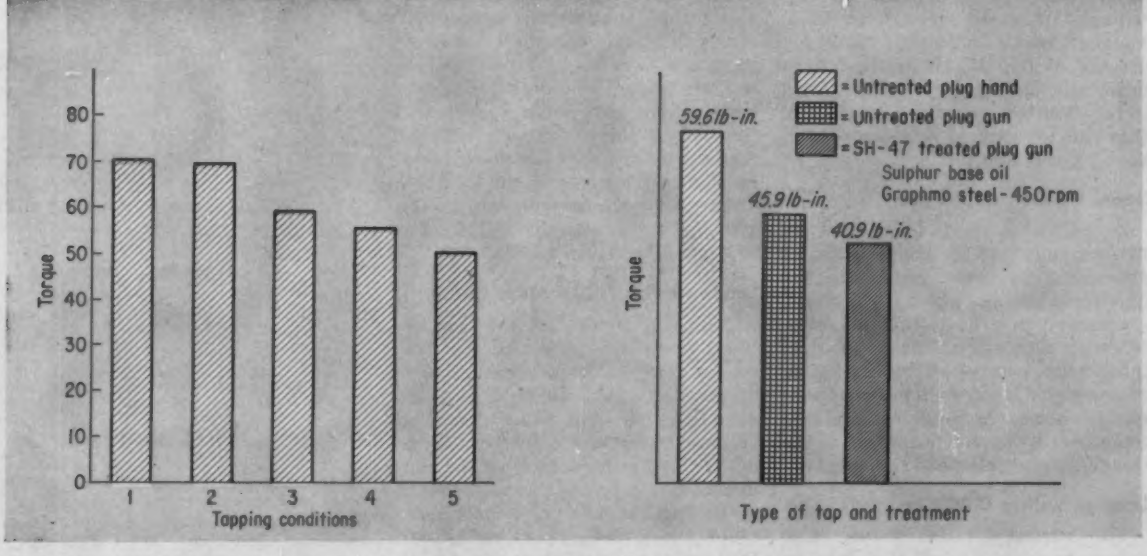
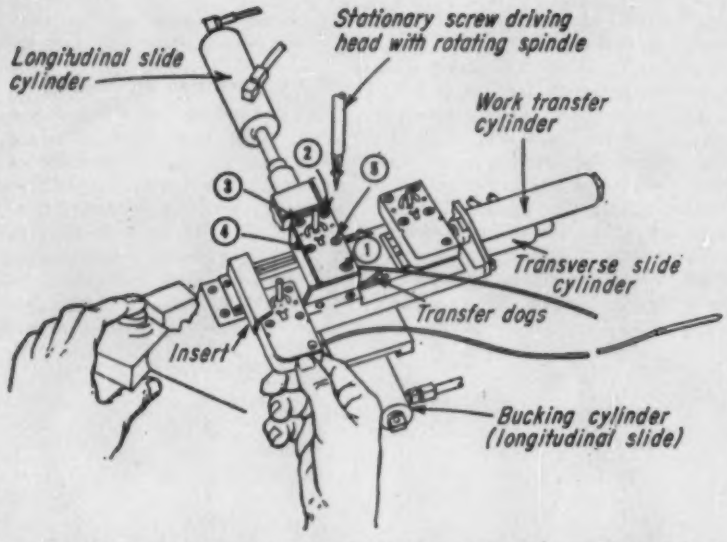


FIG. 8 . . . Comparative torque, ⅜ – 16 N C plug gun tap. Key: (1) tapped dry, (2) soluble oil, 20 to 1, (3) soluble oil, 5 to 1, (4) sulphur-base oil, (5) highly activated, chlorinated sulphurized oil. 3250 steel, 310 Bhn, 450 rpm

FIG. 9 . . . Comparative torque for three types of plug guns



How the sequence table works: Operator loads control unit assembly at left end of transverse slide, then air-cylinder-operated transfer dogs successively move units to working and ejection positions in timed sequence. Circled numbers show sequence in which screws are driven

Automatic sequencing drives 5 screws in 5 seconds

By Paul H Dixon, president, Dixon Automatic Tool Inc, Rockford, Ill

Something like 600 temperature control units an hour are being turned out on a fast-moving conveyorized line at a Midwestern appliance plant. Final operation on the line is fastening of a sheet steel cover to a molded plastic housing, involving driving of five No. 6 Phillips, flat-head, self-tapping, ⅜-in.-long screws in less than six seconds—all the time that can be allotted without bottlenecking the line.

Beats its own time limit

Actually, the job is being done in five seconds (83% of the time available) with a novel automatic sequence table, in which two slides are moved in a horizontal plane at 90° with each other. Table's air cylinders are controlled by precision Microswitch limit switches and solenoid valves. A single-spindle automatic screwdriver does the job instead of a multiple-head screwdriver.

Locates within 0.002 in.

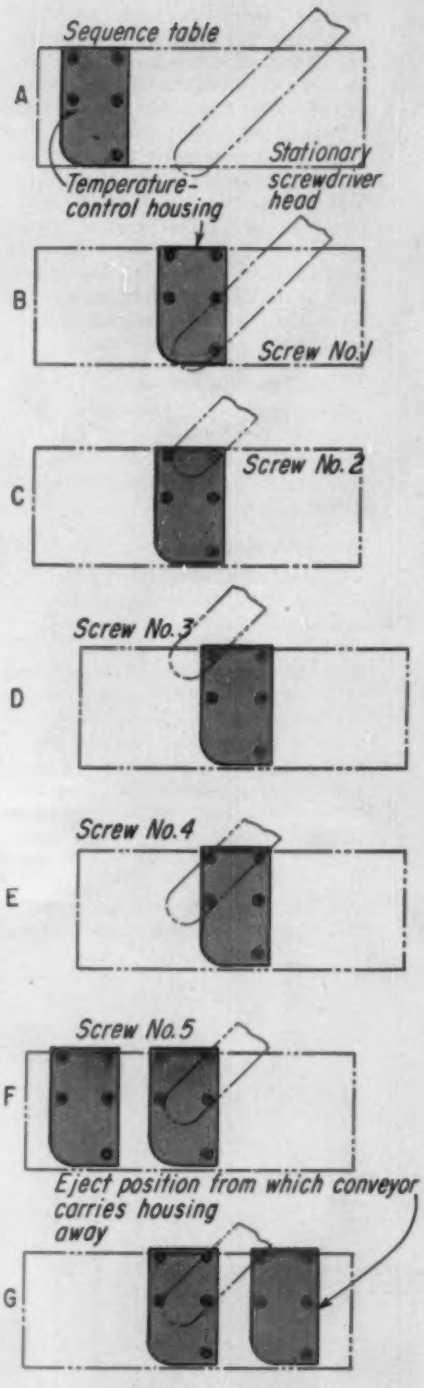
The sequence table locates each screw position under the driving spindle within 0.002 in. Location can be done in any direction, even when the longitudinal slide is positioned by opposing one air cylinder with another to locate the table for the two center screws.

The table has four air cylinders, one for operating the transfer mechanism that shuttles the assemblies across the table, and three for powering the two slides. Flow controls and cushioned cylinders index the table without excessive impact. Cycle time could have been reduced further by using a shorter stroke for the screwdriver spindle, had it not been for the control stem on the housing, which extends 1-5/16 inches beyond the cover plate.

Sequence of Table Movements

Temperature control unit assemblies, ready for mounting the case covers, come to the automatic screwdriver suspended by bulb ends on 45-in.-long flexible tubes from an adjacent overhead conveyor. Without removing the tube from the conveyor, the machine operator picks up the control case, positions a cover plate, and pushes the assembly into the left-hand end of the sequence table fixture.

Insertion of an assembly in the fixture closes a limit switch in the



Sequence of Drivings Screws

Seven steps in the screwdriving cycle show how control unit is positioned under the screwdriving spindle by two slides for driving five screws, is then moved to ejection position. Operator then positions the next assembly in the loading station while fifth screw is driven at F

control circuit, which is completed when the operator presses two palm buttons to start the cycle. When the fifth screw has been driven in the previously positioned assembly (or immediately if this is the first assembly to be processed), the assembly at *A* (see sketch) is moved by transfer dogs into position *B* for driving the first screw and the previously finished assembly is moved to position *G* for ejection.

Succeeding steps

When the first screw has been driven, the longitudinal slide cylinder moves the assembly forward to position *C* for driving the second screw. Then, in sequence, the transverse slide is actuated to move the assembly to the right to locate it for driving the third screw at position *D*.

To drive the fourth screw, the longitudinal slide cylinder returns toward position *B*, but is restricted to a shorter movement by the bucking cylinder at the front of the table, which overcomes the smaller cylinder and locates the table at position *E*. Then, for driving the fifth screw, the transverse slide is returned to its left-hand position at *F*. A new assembly is loaded while the table is in this position. Then both the completed assembly and the new assembly are shuttled across the fixture while the table is moved to position *B* for driving the first screw in the new assembly.

All operations automatic

Once an assembly has been loaded into the fixture, all operations in the cycle are automatic, and are not interrupted unless a screw is missing, is not fully driven, or the plastic case fails to support the torque of the self-tapping screw. In such cases, the sequencing machine stops automatically.

Should the torque-sensing mechanism of the automatic screw driver stop the machine for any reason, the operator closes a manual control pushbutton and opens a poppet valve to retract the screwdriver spindle. After the difficulty has been cleared, the cycle can be resumed by pressing the two palm control buttons. It is not necessary to cycle through previously completed positions to restart the machine.

In order to clear the table of housing before shutting down the machine, a "loader" pushbutton can be depressed to permit a completed assembly to be ejected without the necessity of loading a new assembly into the table.

Automatic conveyor

Continuous movement of the assembly conveyor lifts completed control assemblies from the ejection position on the sequence table (*G* in sketch) without attention from the operator.

You can patent an invention in Russia, but...

Is it true that the Russians consider themselves beyond the reach of international patent laws? That any invention made by the citizens of Western Bloc nations is fair game, and may be pirated by the Soviet Union and her satellites without payment to the patent holder? The answer is a qualified no. You can take out Russian patents on your invention, but there are a lot of strings attached.

You need a specific contract

New Soviet laws governing patents do not differ essentially from those of other countries. BUT unless you have a specific contract with the Soviet Union, there is nothing to stop the Russians from copying your invention unless you have it patented there.

You can take out a Russian patent by first giving the Russians specifications and details of your invention. A search is then made through Soviet and foreign patents and technical literature to make sure the invention is new.

Before the Russians will grant a patent, they must agree that it has actual or potential "industrial utility." In other words, it must apply to a field that competent Soviet technical organizations believe is active, or is likely to become active one day.

Neither the United States nor Great Britain has such a provision in their patent laws, which instead merely require that the invention not be "obvious."

Patent good for 15 years

If a foreign invention passes these tests, the Russians will grant a patent good for 15 years from the date of application, provided renewal fees are paid yearly.

A foreign invention is then protected to such a degree that it is an offense to use the invention without the patentee's consent. However, the USSR reserves the right to issue compulsory licenses if an invention is of special importance to the state. Even so, the patentee is paid for such use.

Import protection, too

The patentee's monopoly under Russian law not only gives him the right to prevent others from manufacturing goods incorporating the invention, but *he also has the right to prevent Russia from importing such goods.*

If a Soviet plant wishes to use an invention which has been patented in Russia by a foreigner, the patentee is notified to this effect by the USSR's Chamber of Commerce, and the actual contract is negotiated by the Soviet Ministry of Trade and one of Russia's state export-import organizations.

The USSR's Committee on Inventions and Discoveries has the final word on whether a patent shall be granted. The Committee has its own appeals procedures, which include the right of the inventor to appear and be heard. Disputes over the ownership of inventions are heard by common courts of law.

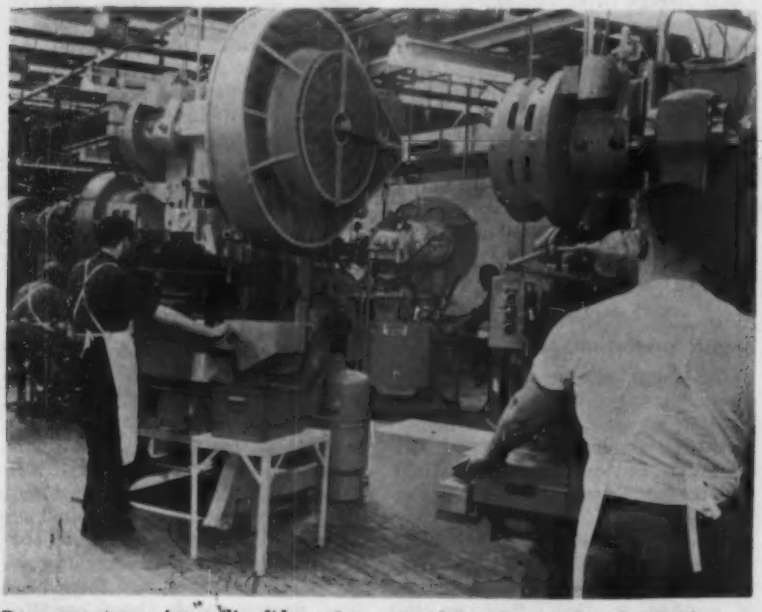
If patent infringement is suspected, the Committee investigates the case. Infringement actions can then be brought before the ordinary courts. However, it seems reasonable to assume that no such action has ever been brought.

This clarification of Russia's stand on international patents came out in meetings of a United Kingdom delegation with the Committee of Inventions and Discoveries. In talking over Russia's new patent laws, which went into effect in April, 1959, the delegation also checked into protection of trademarks in the USSR, found that Russian policy differs little from that in other countries. In fact, the British were told, several hundred British trademarks are registered in Russia, and there have been no complaints about handling of trademarks from Britain or any other country.

IBM improves safety and speeds production with three...

Ground rules for modernizing presses

Pickup mechanism of automatic feeder "reaches" for part as operator inserts another in indexing table nest



Press operators using a die slide at International Business Machines' Poughkeepsie plant are protected by two-hand switches which must be depressed simultaneously before press will cycle

Safety need not go by the boards in an all-out modernization of presses to achieve faster production. On the contrary, International Business Machines found in revamping its Poughkeepsie, N Y, plant press setup that safety and output can both be greatly improved by paying attention to timing, equipment upgrading, and a color-coding program. Here's the plan IBM followed:

Three-Point Program

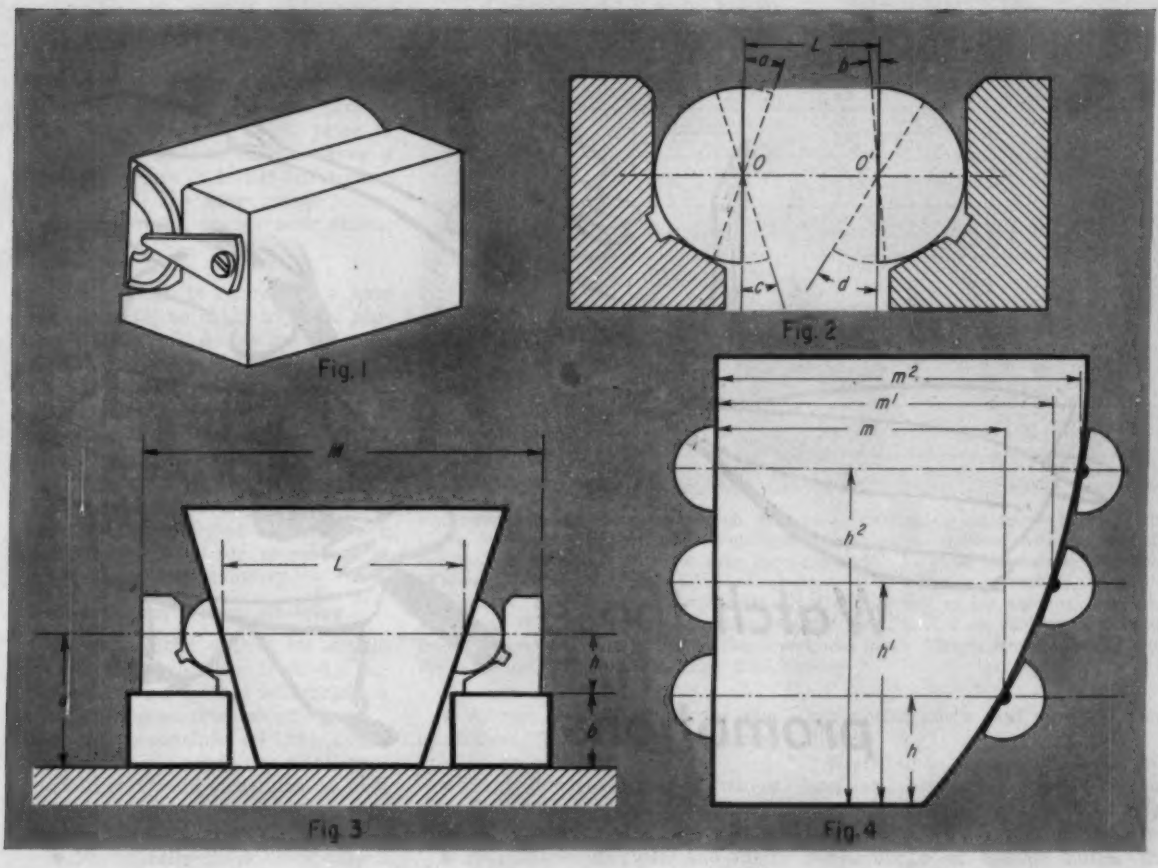
TIMING—In a period pre-selected as a slow one for press operations on components for data-processing machines, IBM shipped 12 V & O inclinables to the builder, Hudson Division, Emhart Mfg Co, Hudson, N Y. These units ranged from 25 to 37 tons in capacity and were purchased between 1942 and 1951.

EQUIPMENT UPGRADING — Air clutches were installed in place of mechanical dog clutches to gain more positive operation. The builder was also instructed to equip three of the 37-ton presses with V & O "Feed-O-Matic" devices. These feeders eliminate the need for an operator ever to put his hand under the punch. Instead, the operator simply places the parts on the indexing table which brings them one at a time to the pickup point. Here they are grasped by the pickup mechanism and carried to and placed in the die. Press operation is controlled by the automatic feeding mechanism's cycle.

Out of Danger

IBM also developed and installed die slides (*AM*—Feb 9 '59, p111) for the other presses, which are used principally for low-production runs. These slides are operated by two hand-switches, which must be depressed simultaneously. Thus, the operator's two hands are kept completely out of the press danger zone.

COLOR CODING—On presses, as with other equipment in IBM plants, each major component of the unit—such as the press clutch and electrical control boxes or panels—has a distinctive color. The same color is used on piping or wiring between source and component.



HALF-ROUND GAGING BLOCKS

—France's answer to taper-measuring problems

By Charles Minaire, St Etienne, France

In common use in France, but virtually unknown in this country, Micyl gaging blocks* offer an almost unlimited number of applications in an inspection department, for measuring across tapers.

What They Are

Each block of a pair (Fig. 1) consists of a half-cylinder resting in a V-block. (It's prevented from falling out by two small hooks that engage recesses in the ends). The measuring face of the half cylinder is accurately ground so that it passes exactly through the centerline.

The distance between the centers O and O' (Fig. 2) will remain unchanged, regardless of the angle (*a*, *b*, *c*, or *d*) to which the blocks are swiveled. The measuring faces are oriented by the surfaces with which they are placed in contact, using only the pressure of the measuring instrument, vernier caliper, micrometer, or other. The height of the centers above the base is fixed, as is the distance across the backs of the V-blocks when both blocks are in contact with each other. The accuracy of these dimensions is guaranteed by the manufacturer within 0.000,040 in. (0.001 mm).

How They Work

To measure the diameter of a tapered surface at a given point (Fig. 3) it is only necessary to set the blocks on gage blocks so that the height of the centerline corresponds to the given distance from the end of the work. In other words, gage blocks *b*, plus known height *h*, equals given distance *d*. By measuring across the back of both blocks (*M*) and subtracting the known width of the mated pair, the required dimension (*L*) is obtained. The angle of the taper has no bearing on the reading provided it is less then 90°.

Advantages

This system is much faster and more accurate than the conventional method of measuring across pins, as it not only does away with possible errors in setup, but is independent of surface defects which might occur at the point of application of the pins. The blocks may be used for checking any taper in which the included angle is less than 90°, as well as for curved surfaces (Fig. 4), provided the tangents at the points of contact are less than 45° from a line normal to the base.

* Micyl blocks are patented, and produced by Precision Mecanique Labinal, Paris, which holds world marketing rights. Blocks are available in both metric and inch sizes.

Watch those first promotions!

By P W Robson, plant manager, Wolverine Tube Division, Calumet & Hecla Inc, Decatur, Ala

First promotions have to be *right*. The first step up the ladder, say from production worker to leader of a small group, is in many ways more critical than the steps at higher rungs. It is this first advancement that marks a transition in the relationship between the worker and employer and, equally important, between the promoted man and his co-workers. Here is where he leaves the comparative security of being "just one of the boys" to take on added responsibilities and to become, in however small a way, a member of his company's management team.

Careful attention to first promotions has paid off handsomely for us. When our Decatur, Ala, plant opened in 1948, it was one of the first industrial organizations in an essentially agricultural area. The workforce consisted mostly of people skilled in working with farm equipment, not metalworking machinery.

Today many of our supervisory and managerial people are from that originally unskilled group. The success of our promotions-from-within is largely due to the way we handle first promotions.

We have found that, in the first-promotion operation, three facets are of major importance. And all are equally important.

Selection

If a promotion system is going to work, it's obvious that an equitable, simple, and clearly defined set of criteria should be set up to guide selection of candidates for promotion. Too, the whole evaluational procedure should be simple and easy.

Our supervisors use a simple form (see right) as the basis for recommending promotion from operator to group leader. The column headings on this form are the criteria for evaluating the men. In the evaluation, each man within a group is ranked according to his standing in the group. For instance, preference is given to older men because, all other things being equal, an older man will generally be more mature than a younger one. In the age column, the oldest man in the group is assigned a value of 1, the next oldest 2, and, in a group of 5 the youngest would be rated 5.

When similar ratings for all the criteria have been totaled, the man with the lowest total ranks first. He becomes a candidate for promotion. When the statistical data in the promotion-rating form agrees with personal observations from other sources, the worker is ready for his first promotion.

As the form shows, we use seven criteria in our evaluation: age, education, mental-ability test score, veteran status, length of service in the plant and in the department, attendance record, and average of annual work-performance ratings.

Recognition

Once we make a decision to promote a man to group leader, specific recognition is made of the event. On the day the promotion is to take effect, the department's general foreman and the production superintendent bring the man to the office of the industrial and public relations manager. At this meeting the method of selection is discussed. The selected man is told that he has competed against others, and he is offered the promotion. The general foreman then outlines his new duties and responsibilities. And, importantly, the general foreman emphasizes to the new group leader that the promotion is considered an important event both for him and for the company.

After the interview the general foreman returns to the department

and carefully informs the other employees considered for this promotion. This personal touch, prior to the official announcement, saves a certain amount of initial embarrassment when the new group leader returns to take up his new duties.

Instruction

If a man is to carry out a new job properly, he needs to know precisely what his duties and responsibilities encompass—particularly if the job carries great responsibility. For this purpose, the newly appointed group leader gets a detailed list of responsibilities that spell out his job function. As the following list shows, his duties as group leader give him a variety of experience to qualify him later for promotion to supervisory responsibility.

Group Leader Responsibilities

- Assign jobs within his group, based on instructions from his supervisor, in a way that will maintain maximum departmental efficiency.
- Be responsible for the availability of tools needed to fulfill production and work schedules, as well as requisitioning and obtaining supplies as required.
- Periodically check work output to see that quality specifications and production standards are being met.
- Make out time sheets and keep records and prepare reports as directed by the supervisor.

Name	Age	Edu.	Test	Vet.	Length of Service: Plant	Dept.	(a) Attend.	Ratings: 1	2	3	4	5	6	7	Avg.	Tot.	Rank	(b) Wgt.
Jackson	43	H.S.	15	No	2-10-49	2-10-49	32WN 17T 22LA	88	86	92	90	92			90	14	1	
Vines	27	H.S.	18	Yes	5-20-50	5-20-50	14WN 2T 8LA	90	88						89	16	2	
Mason	25	H.S.	19	Yes	11-30-49	2-2-50	8WN 5T	84							84	17	3	
Phipps	30	H.S.	15	No	2-15-49	2-15-49	10WN 5T 11LA	88	84	93	88	90	88		88	20	4	
Mann	25	H.S.	16	Yes	3-12-50	8-14-53	52WN 9T 2WP 19LA	88	90						89	21	5	
Parkman	31	9th	15	Yes	5-2-50	5-10-50	45WN 4T 1WP 35LA	84	90	88					87	24	6	

Performance-rating form ranks each man in a work group on seven basic points. Later, opinion and personal observation of superiors are combined with this statistical analysis to select the best man for promotion. KEY (a) Attendance symbols: WN—with notification, LA—leave of absence, WP—without permission, T—tardy. A man gets a "WN" if he notifies the plant on the day of his absence, otherwise he gets a "WP." (b) Weight column is reserved for 1, 2, 3, 4 etc ranking of the men based on personal observation by the department head. This is later combined with the statistical rating to determine final ranking

- Advise the supervisor of any conditions that affect efficiency, quality, or safety.
- Shut down equipment where safety hazards exist and immediately notify the supervisor of such action.
- Advise the supervisor and other affected departments of unusual processing difficulties.
- Maintain cleanliness standards.
- Make suggestions to the supervisor for improvements in efficiency, production costs, and working conditions.

Knowing in advance that his job responsibility includes evaluation of current practices and recommendations for improvements—not just the performance of routine duties—the group leader is more likely to contribute to the betterment of the plant. He also contributes to his own development toward future management responsibility.

ASME Honors 65-Year Member

Fred H Colvin, 93, a member of the American Society of Mechanical Engineers since 1895, was honored by ASME recently at a luncheon at the Engineers' Club in New York. Mr Colvin was presented with a certificate in recognition of his lifetime of distinguished service to mechanical engineering and his longtime membership in the Society. He has been a Fellow of ASME since 1941.

Fred Colvin started his long career as machinist, engineer, writer, and editor in 1883 as an apprentice in the machine shop of the Rue Manufacturing Co in Philadelphia. He became the first editor of *Machinery* in 1894. In 1907 he joined AMERICAN MACHINIST and was made Editor Emeritus in 1937. He is the author of some twenty books, among them the *American Machinist's Handbook*, first edition of which appeared in 1908.

At right, Mr Colvin (center) receives the certificate and the congratulations of W L Cisler (right), ASME president, and O B Schier II, secretary.

14 steps TO DESIGN A DIE

STEP 11

How to Apply Fasteners

Part 2

By J R PAQUIN, supervisor,
Tool Engineering Dept.,
Cleveland Engineering Institute

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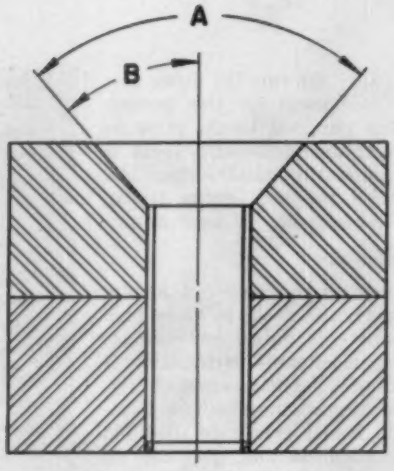
In the previous installment (AM/MM—Feb 8, '60 p 116) rules were given for application of socket capscrews. Other fasteners commonly used in design of tools and dies include:

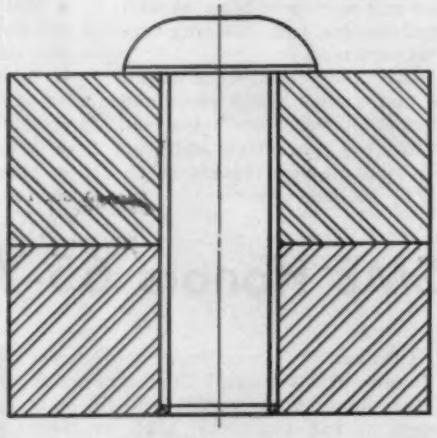
Socket flat-head screws
Socket button-head screws
Socket setscrews
Hollow lock screws
Socket shoulder screws
Dowels and rivets

Although these types of fasteners are employed less frequently, the designer should understand the specialized conditions which require their use. Dowels are treated in detail in this installment, and rivets as they apply to tools and dies. Several tables aid selections.



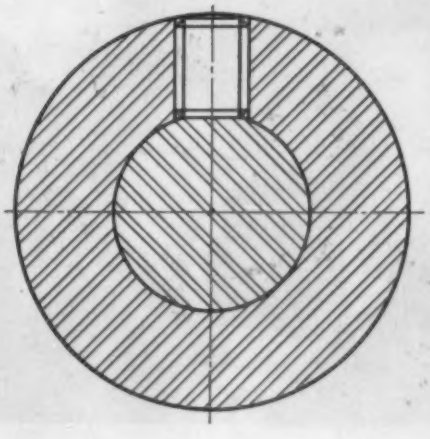
1.. SOCKET FLAT-HEAD SCREWS. Heads of these screws are machined to an 82° included angle, dimension *A*. They are employed for fastening thin plates which must present a flat, unbroken surface. Avoid their use when possible, because they cannot be tightened as securely as capscrews. Employ them only for flush applications when plates to be fastened are too thin for counterboring. For tool work, *socket* flat-head screws are always specified in preference to the slotted type.

To draw the side view, look up the head diameter in a handbook or manufacturer's catalog, and mark points to the specified dimension. Then the tapered lines of the head are drawn with the protractor set to an angle of 41° from the screw axis, dimension *B*.

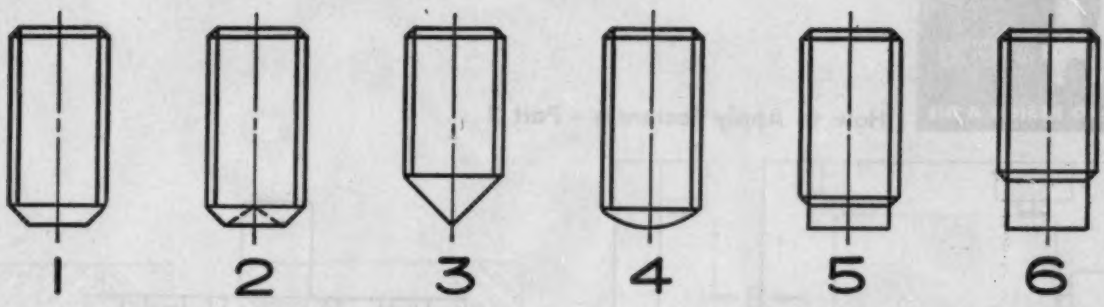


2.. SOCKET BUTTON-HEAD SCREWS. These screws are employed for fastening plates in applications where a raised head is not objectionable. They should be used when plates are too thin for counterboring for capscrews, and surfaces need not be flush or flat. In dies, they fasten the stripper plate, back gage, and front spacer to the die block.

Button-head screws project only slightly above the surface. Their rounded contours prevent injuries to operator's hands.



3.. SOCKET SETSCREWS. When first developed, socket setscrews were called "safety" screws. They were employed to lock rotating machine parts to their shafts. They replaced screws with protruding heads which were dangerous because clothing could become caught by the whirling projection. A socket setscrew is threaded its entire length, and it is provided with an internal driving socket at one end.



4.. POINT STYLES FOR SETSCREWS. There are six styles of setscrew points. The designer must be able to specify the correct style of point for the specific application:

1. The flat point is most commonly used for jigs, fixtures, and dies. Flat-point setscrews are employed as adjustable stops, clamp screws, and to lock hardened shafts.

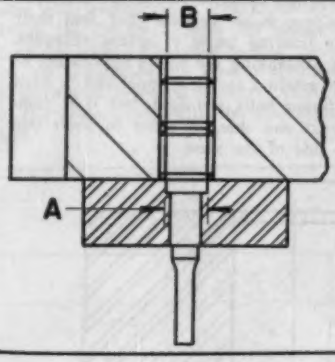
2. Cup-point setscrews are used to lock pulleys, collars, gears, and other parts on soft shafts. The sharp edges cut into the metal of the shaft to effect more or less permanent positioning.

3. Cone-point setscrews may be employed for the same applications as cup-point screws. However, a much more positive lock is effected because the shaft is first spotted or drilled to engage the conical point of the screw.

4. Oval-point setscrews are employed to lock parts which are to be adjusted frequently relative to each other. A groove is ordinarily provided of the same general contour as the point against which it bears. This groove may be machined angular, lengthwise, or in any other direction to the shaft axis.

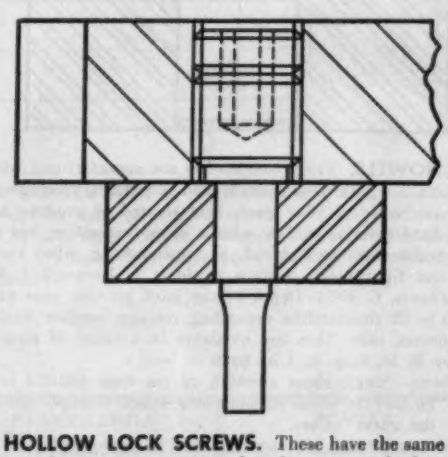
5. Half dog-point setscrews are frequently employed to engage slots milled longitudinally in shafts. They allow lengthwise movement, but prevent rotation. The point also acts as a stop to limit travel.

6. Full dog-point setscrews are employed for exactly the same purposes as half dog-point setscrews. They are not appreciably more efficient and therefore are now seldom used and they must be ordered special.



PUNCH HEAD DIA. A	TAP DRILL DIA. B	TAP
3/16	#7 (.201)	1/4 - 20
1/4	#F (.257)	5/16 - 18
5/16	5/16	3/8 - 16
3/8	27/64	1/2 - 13
1/2	17/32	5/8 - 11
5/8	21/32	3/4 - 10
3/4	49/64	7/8 - 9
7/8	7/8	1 - 8

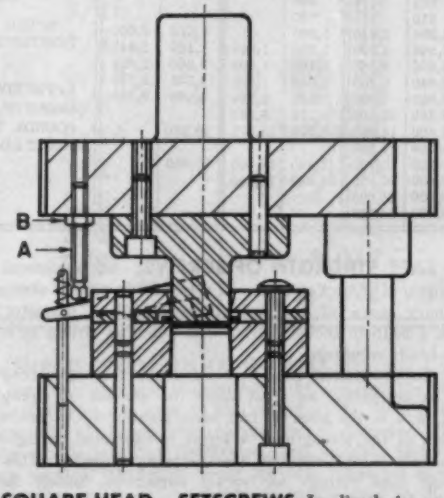
5.. PUNCH-RETAINING SETSCREWS. This table facilitates selection of the correct setscrew size after punch head diameter *A* has been established. It will help to eliminate errors, because in every instance tap-drill size *B* is larger than head diameter *A* of the punch. This provides for quick removal and replacement of nicked or broken punches.



6.. HOLLOW LOCK SCREWS. These have the same dimensions as socket setscrews, except that they are much shorter, and the hexagonal driving socket is broached clear through the screw. The length is one-half the diameter for most sizes. They are employed to lock setscrews securely against loosening.

A big advantage for some applications is that the lock screw need not be completely removed when re-setting the setscrew. It is simply backed up a turn or so and the setscrew socket is reached through the lock-screw hole for re-setting to a new position.

In the design of dies, lock screws are employed to lock punch-retaining setscrews under crowded conditions.



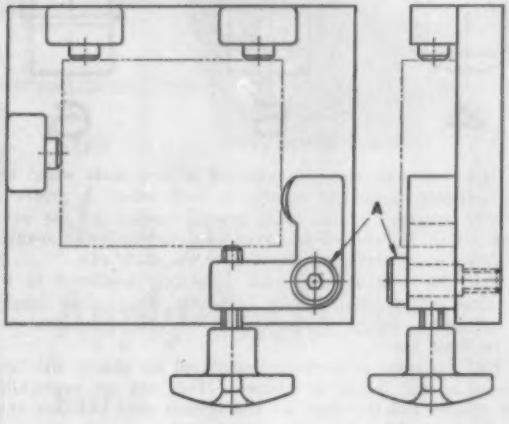
7.. SQUARE-HEAD SETSCREWS. In die design, only one application remains for such screws. This is as the actuator for an automatic stop.

The right section view of a representative die illustrates the manner in which a square-head setscrew *A* is applied to operate an automatic stop. A jam nut *B* effectively locks the screw against rotation. Note that the hole for the setscrew is tapped all the way through the punch holder. This permits re-setting it back as punches are shortened in sharpening.

A square-head setscrew is measured from under the head to the end, and this is the specification listed in the bill of material.

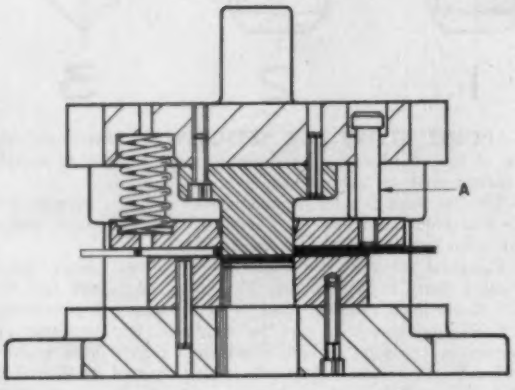
14 steps TO DESIGN A DIE

How to Apply Fasteners — Part 2...



8.. SHOULDER SCREWS. Shoulder screws are used to provide pivots for rocking members of jigs and fixtures and to limit travel of components. A shoulder screw is provided with a body ground to accurate size, a head with an internal driving socket, and at the other end it has a smaller threaded portion.

The illustration shows a corner clamp employed to clamp square and rectangular workpieces against locating buttons for accurate positioning. The corner pivots about screw *A*.



9.. STRIPPER BOLTS. When shoulder screws are employed in dies, they are called stripper bolts, because they find their most common application in limiting travel of spring strippers.

This front section view of a blanking die shows application of stripper bolts *A*, employed to retain a spring stripper and to limit its travel. Four or more stripper bolts are used, but it is common practice to draw only at one side, in order to show one of the springs at the other side of the view.

SAFE STRENGTH OF SCREWS

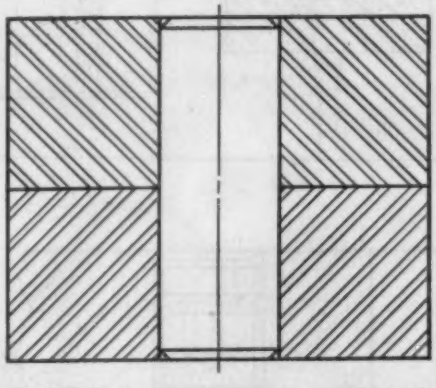
SCREW SIZE	SOCKET CAP SCREWS		SOCKET FLAT HEAD SCREWS		SOCKET BUTTON HEAD SCREWS		AFTER TIGHTENING: EFFECTIVE STRENGTH, IN POUNDS, TO RESIST LOAD.
	N.C.	N.F.	N.C.	N.F.	N.C.	N.F.	
# 4	540	585	465				
6	810	910	700				
8	1,250	1,315	1,080		1,010	1,060	
10	1,565	1,790	1,350	1,545	1,260	1,445	
1/4	2,850	3,260	2,460	2,805	2,300	2,625	
5/16	4,620	5,200	4,045	4,480	3,785	4,190	
3/8	6,950	7,900	5,595	6,790	5,595	6,300	
7/16	9,250	10,400	8,215	9,185			
1/2	12,400	14,000	10,975	12,375	10,250		
9/16	15,500	17,200					
5/8	19,150	21,700	17,485	19,800	16,350		
3/4	27,500	30,750	25,880	28,660			
7/8	38,500	41,900					
1	48,500	54,500					

12.. SAFE STRENGTH OF SCREWS. As a general rule, the strength of a socket screw is comparable to the strength of an ordinary screw of the next larger standard diameter. For example, a 5/16-18 socket capscrew is about as strong as a ⅜-16 hexagon-head capscrew.

Many factors enter into the determination of strength of screws. In designing, we must know the amount of strength *remaining* in a screw after it has been tightened. A considerable proportion of the strength of a screw is expended in tightening. What is left is the effective load-carrying capacity. This table lists these load ratings for socket capscrews, socket flat-head screws, and socket button-head screws.

The table is based on a breaking strength of 180,000 psi, which applies to most socket screws. Read the values directly in selecting die fasteners intended to resist specific loads. These values will be found of particular importance in determining the sizes and number of screws required for fastening punches and stripper plates.

After the stripping pressure has been calculated, turn to this table and read values directly. When selecting stripper bolts, choose values given for socket capscrews of the same diameter and threads per inch as the threaded portion of the stripper bolt.



13.. DOWELS. These components are manufactured with exacting accuracy both dimensionally and in physical characteristics. Dowels are made of alloy steel, heat treated to produce an extremely hard exterior surface with a somewhat softer, but tough core to resist shear and spread, or mushrooming, when they are driven into tight holes. Surface hardness is Rockwell C 60-64; core hardness, C 50-54. Depth of the hard exterior case extends from 10 to 20 thousandths depending on size, smaller sizes having a thinner case. They are available in a range of sizes from ⅛ in. by ⅜ in. long, to 1 in. by 6 in. long.

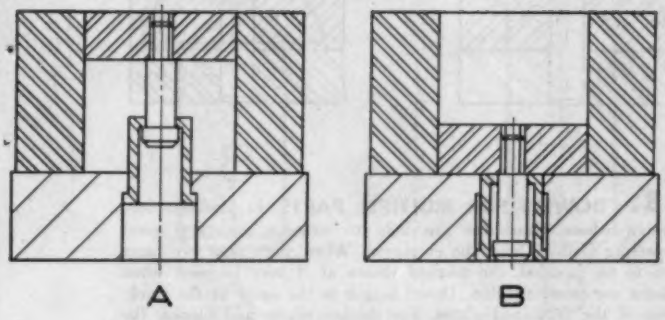
STRENGTH—Single shear strength ranges from 150,000 to 210,000 psi. To find the shear strength of a dowel, multiply the dowel area by the above values.

OVERSIZES—Dowels are manufactured in two oversizes:

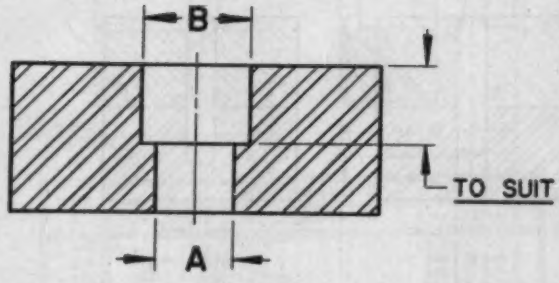
1. Regular dowels, employed for all new jigs, fixtures, and dies are made 0.0002 in. oversize to provide a secure press fit.

2. Oversize dowels are made 0.001 in. oversize. They are used for repair work when dowel holes have been enlarged through repeated pressing of dowels in and out, and when holes have been accidentally machined oversize.

SURFACE FINISH—Manufacturers precision grind dowel surfaces to a tolerance of ±0.0001 in. and surface smoothness is held to 6 to 8 RMS, maximum. This extremely smooth finish reduces the possibility of galling or seizing when dowels are driven in or out of their holes.



10.. TELESCOPING SLEEVES. When stripper plates or pressure pads require long travel, but stripper bolts cannot extend below the die set because the bolster plate of the press is not provided with a clearance hole, a telescoping sleeve may be employed to increase the amount of travel. At *A*, the pressure pad is illustrated in raised position. At *B*, it is shown at the bottom of the press stroke with the sleeve telescoped over the stripper bolt.

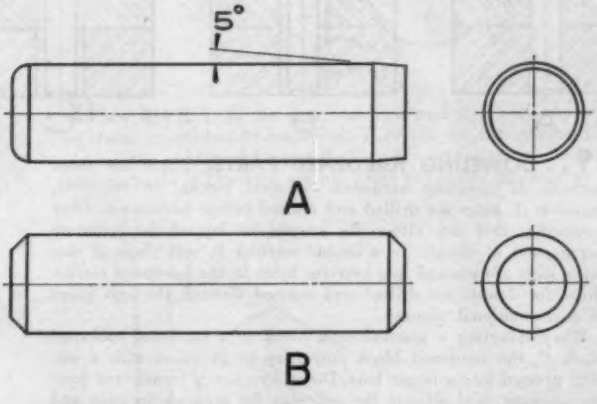


11.. HOLES FOR STRIPPER BOLTS. When specifying holes for stripper bolts, observe these rules:

1. Holes *A* which engage stripper bolt bodies are specified a slip fit, or sliding fit, by giving nominal diameter followed by the abbreviation S.F.

Example: ½ DR. & RM. THRU—S.F.

2. Counterbore diameter *B* is specified 1/32 in. larger than the head diameter of the screw.



14.. DOWEL SHAPE. Standard dowels are given a 5° taper at one end for easy starting, as shown at *A*. A small radius is applied to the other corner. However, to save time, they are drawn conventionally by showing a chamfer at each end, as shown at *B*.

SHEAR STRENGTH OF DOWELS

DOWEL DIA.	SAFE LOAD IN POUNDS
1/8	164
3/16	368
1/4	655
5/16	1,022
3/8	1,473
7/16	2,004
1/2	2,618
5/8	4,090
3/4	5,890
7/8	8,017
1	10,472

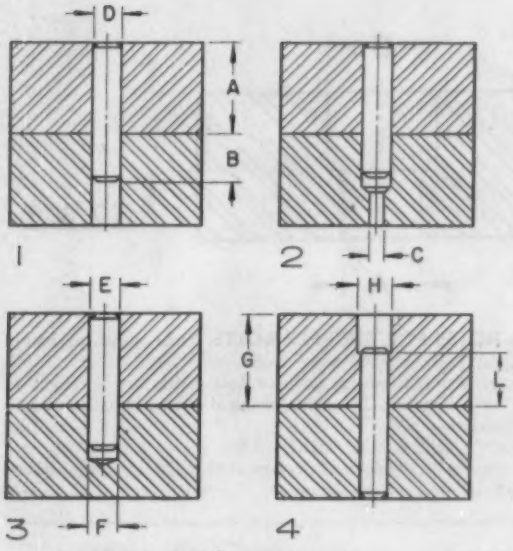
15.. SHEAR STRENGTH OF DOWELS. The safe load that dowels can resist in shear is determined by dividing the ultimate shear strength by the area of the dowel. This table lists safe shear strengths of dowels from ⅛ to 1 in. in diameter. Ultimate shear strength is taken at 190,000 psi, and a safety factor of 12 has been applied. Therefore, these are safe loads for dowels in single shear under shock conditions as encountered in dies. For double-shear applications, values should be doubled.

REAMER DRILL DIAMETER		REAMER DIAMETER	
NOMINAL SIZE	DECIMAL SIZE	NOMINAL SIZE	DECIMAL SIZE
5/16	.307	5/16	.3125
3/8	.366	3/8	.375
7/16	.427	7/16	.4375
1/2	.489	1/2	.500
5/8	.616	5/8	.625
3/4	.734	3/4	.750

16.. REAMING DOWEL HOLES. When a hole is to be reamed for press fitting a dowel, it is first drilled with a reamer drill, then reamed. Reamer drills have the same nominal size as the corresponding reamers, but their diameters are actually smaller. For example: a 5/16-in. reamer drill has a diameter of 0.307 in. and actual reamer size is 0.3125 in., leaving 0.0055 in. of metal for the reamer to remove.

14 steps TO DESIGN A DIE

How to Apply Fasteners—Part 2...



17.. PROPORTIONS OF DOWELS. Conditions under which dowels are employed determine the type of application chosen. There are four:

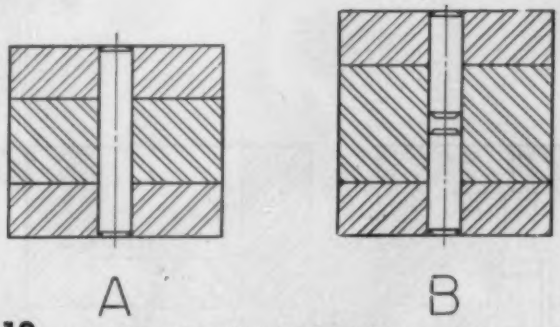
1. THROUGH DOWELS. In this application, the hole is reamed all the way through, and dowels can be pressed out from either side. Dimension *A* is 2 in. or less. Dowel engagement *B* is between 1½—2 *D*.

2. SEMI-BLIND DOWELS. In this application, the dowel hole is drilled and reamed from one side at least ⅛ in. deeper than dowel length. A smaller hole is drilled through the block and the dowel can be pressed out from one side only. Dimension *C* of the knockout hole is made ½ *D* plus 1/64 in. or one half dowel diameter with clearance for use of a standard diameter punch for pressing out.

3. BLIND DOWELS. This application should be avoided. Blind dowels are more difficult to fit because of trapped air, and removal can be troublesome. Diameter *E* is made a press fit. Diameter *F* at the blind side should be specified as being a sliding fit, or slip fit.

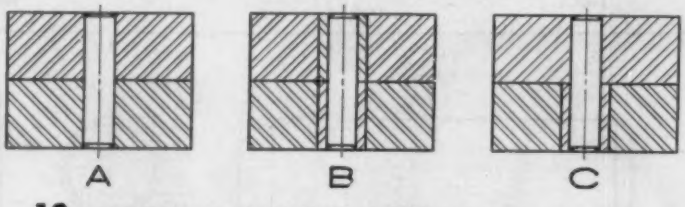
4. RELIEVED DOWELS. When doweling blocks over 2 in. thick (dimension *G*), standard length dowels are employed and the hole *H* is specified 1/32 in. larger than the diameter of the dowel for relief. This relief is applied to that portion of the hole not in actual contact with the dowel surface. Engagement length *L* is 1½—2 *D*.

SLIP FITS—Normally, dowels are press fitted into both members. Holes are drilled and reamed after the jig, fixture, or die has been completely assembled, and often even tried out. However, when parts are subject to frequent disassembly, as for instance for sharpening, dowels are press fitted in one component and made a sliding fit in the other for ease of disassembly.



18.. DOWELS FOR MULTIPLE PARTS. In precision tool design where clearances are held to extreme accuracy, good doweling methods must be employed. When more than two parts are to be doweled, the method shown at *A* may be used when plates are relatively thin. Dowel length is the same as the thickness of the combined plates. For thicker plates and blocks, the method illustrated at *B* is preferred. Two dowels engage each dowel hole. The outer plates are thus doweled to the center block.

LENGTH OF DOWELS—It is common practice to make the length of a dowel four times its diameter.

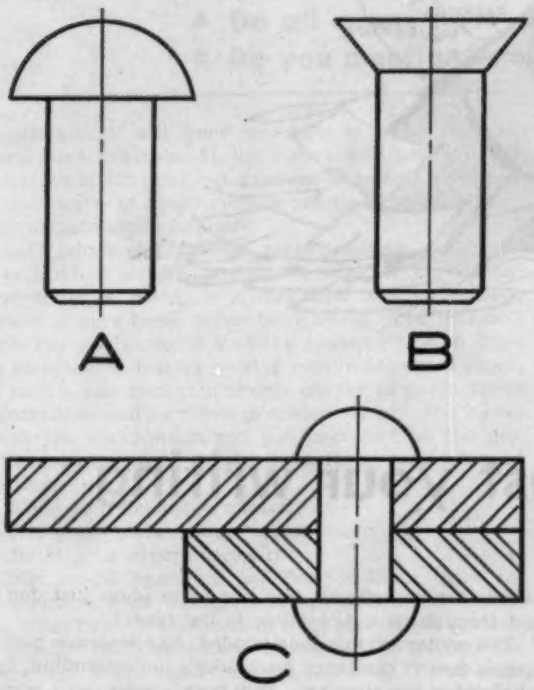


19.. DOWELING HARDENED PARTS. There are three methods of doweling hardened tool-steel blocks. In the first, shown at *A*, holes are drilled and reamed before hardening. After hardening, they are either jig ground or lapped for accurate engagement of dowels. In a second method *B*, soft plugs of machine steel are pressed into oversize holes in the hardened blocks. Holes for dowels are drilled and reamed through the soft plugs in a conventional manner.

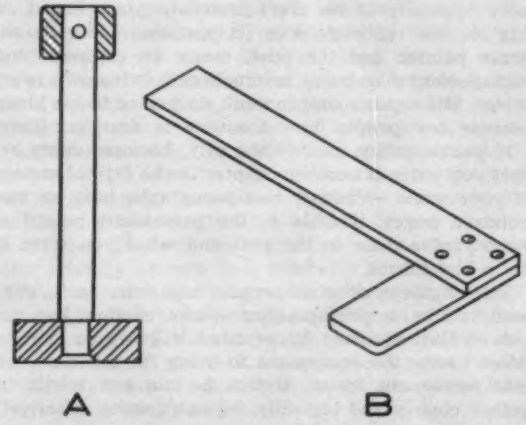
When doweling a machine-steel block to a hardened tool-steel block *C*, the hardened block only may be provided with a soft plug pressed into a larger hole. Dowel location is transferred from the machine steel plate to the soft plug for accurate location and fit of dowels.

SCREW DIAMETER	DOWEL DIAMETER	
	TOOLS	DIES
# 8	1/8	1/8
# 10	1/8	3/16
1/4	3/16	1/4
5/16	1/4	5/16
3/8	5/16	3/8
7/16	3/8	7/16
1/2	7/16	1/2
5/8	1/2	5/8
3/4	5/8	3/4

20.. DOWEL DIAMETER. For jigs, fixtures, and gages always make dowel diameters one size smaller than corresponding screw diameters. For dies, dowels are made the same diameter as the screws because of the high speed and shock conditions encountered.



21.. RIVETS. In the design of tools and dies, only two types of rivets are commonly employed. They are the button-head rivet *A*, and the countersunk rivet *B*. They are employed for fastening thin plates as at *C*, which are not likely to require disassembly for repair.

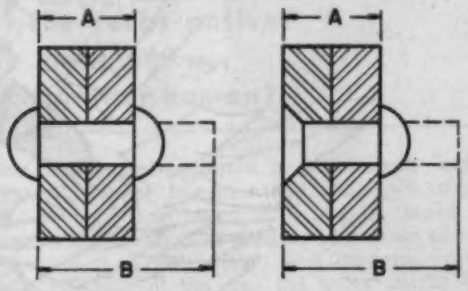


22.. RIVET APPLICATIONS. Riveting is not often employed for fastening die parts. There are two exceptions:

1. A knockout rod is usually turned down at its end, pressed into the knockout plate, and the end is then peened or riveted to the back gage, as shown at *A*.

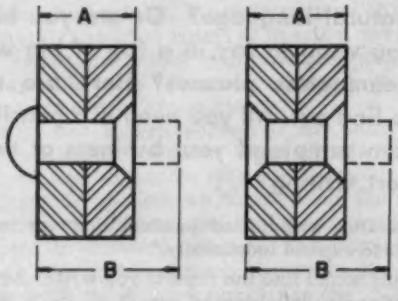
2. In another application, the strip support is often riveted to the back gage, as shown at *B*.

RIVET LENGTHS, BUTTON RIVETING



GRIP A	RIVET DIAMETERS							LENGTH B
	1/8	3/16	1/4	3/8	1/2	5/8	3/4	
1/4	5/8	3/4	7/8	1	1 3/16	1 3/8	1 1/2	
3/8	3/4	7/8	1	1 1/8	1 5/16	1 1/2	1 5/8	
1/2	7/8	1	1 1/8	1 1/4	1 7/16	1 5/8	1 3/4	
5/8	1	1 1/8	1 1/4	1 3/8	1 9/16	1 3/4	1 7/8	
3/4	1 1/8	1 1/4	1 3/8	1 1/2	1 11/16	1 7/8	2 1/16	
7/8	1 1/4	1 3/8	1 1/2	1 5/8	1 13/16	2	2 3/16	
1	1 3/8	1 1/2	1 5/8	1 3/4	1 15/16	2 1/8	2 3/8	
1 1/8	1 1/2	1 5/8	1 3/4	1 7/8	2 1/16	2 1/4	2 1/2	
1 1/4	1 5/8	1 3/4	1 7/8	2	2 3/16	2 3/8	2 5/8	
1 3/8	1 3/4	1 7/8	2	2 1/8	2 3/8	2 1/2	2 3/4	
1 1/2	1 7/8	2	2 1/8	2 1/4	2 1/2	2 11/16	2 15/16	
1 5/8	2	2 1/8	2 1/4	2 3/8	2 5/8	2 13/16	3 1/16	
1 3/4	2 1/8	2 1/4	2 3/8	2 1/2	2 3/4	3	3 1/4	
1 7/8	2 1/4	2 3/8	2 1/2	2 5/8	2 7/8	3 1/8	3 3/8	
2	2 3/8	2 1/2	2 5/8	2 3/4	3 1/16	3 1/4	3 1/2	

RIVET LENGTHS, FLUSH RIVETING



GRIP A	RIVET DIAMETERS							LENGTH B
	1/8	3/16	1/4	3/8	1/2	5/8	3/4	
1/4	3/8	1/2	5/8	3/4	13/16	7/8	7/8	
3/8	1/2	5/8	3/4	7/8	15/16	1	1	
1/2	5/8	3/4	7/8	1	1 1/16	1 1/8	1 1/8	
5/8	3/4	7/8	1	1 1/8	1 3/16	1 1/4	1 1/4	
3/4	7/8	1	1 1/8	1 1/4	1 5/16	1 3/8	1 3/8	
7/8	1	1 1/8	1 1/4	1 3/8	1 7/16	1 1/2	1 9/16	
1	1 1/8	1 1/4	1 3/8	1 1/2	1 9/16	1 5/8	1 3/4	
1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 11/16	1 3/4	1 7/8	
1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 13/16	1 7/8	2	
1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	1 15/16	2	2 1/8	
1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/16	2 5/16
1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8
1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8	2 7/16
1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8	2 3/4	2 7/8
2	2 1/8	2 1/4	2 3/8	2 1/2	2 11/16	2 3/4	2 7/8	

23.. RIVET PROJECTION. In applications which require riveting, an important consideration is the amount that the rivet end must project for upsetting or riveting. If this amount is insufficient, the riveted joint will be weak. If too long, excessive pressure or peening will be required and an unsightly joint will be formed.

These tables list correct lengths of projections for rivets from ⅛ to ¾ in. in diameter. Note that when a tool component is turned down for riveting, as for instance a knockout rod, the same amount of projection would be applied, determined by its diameter.

How to write better reports—I

Three ways to test your writing

By Tom Johnson, associate editor

Are your reports *really* getting through to the boss? Are you putting your points over in clear, natural language? Or are you hiding what you want to say in a fog of big words and meaningless phrases? Here are three ways to find out. All you need is a pencil and a random sample of your business or technical report writing . . .

"A substance without independent shape or volume, that tends to expand indefinitely."

Does this sound like the reports you write? Actually, it's a dictionary definition of gas.

Are your business or technical reports as good as your company's products? If they are, they're well designed, have a clear function, and give good service to the user. If they aren't they probably sound something like this:

In the course of the investigation an exchange of views was made by various members of the committee on the question of the feasibility of an up-to-date production control system (including the desirability of investment in modern processing equipment) in which the viewpoints of all present were expounded. With respect to the production control question, an understanding was reached, subject to the approval of the other departments directly concerned, that further study should be made with a view to achieving a program which would be in accordance with the optimum interests of all concerned and in the interest of the maintenance of the company's interests from the standpoints of profitability and competition.

"The committee met, talked about modernizing the production-control system, and decided to look into the matter further." That's a condensation, in plain English, of gaseous prose. The original smothers the reader in a fog of words, and conveys the impression that the writer is a little on the hazy side himself. True, it isn't too hard to understand, but most of the words are superfluous, and the main ideas just don't get through on a direct line to the reader.

The writer of this long-winded, two-sentence paragraph doesn't challenge his reader's understanding, he challenges his stamina. Any busy reader will want to resign before he has read ten similar paragraphs.

What your reader wants

A good report *communicates*. The person who reads your reports wants to know something. He also wants to know what you think. If he discovers nothing, or—more typically—if he can't translate your brand of English, the report fails in its purpose. Like the abstract painter and the poet, many an engineer and management man today is imprisoned in his own ivory tower. His reports simply don't do justice to his ideas, because few people have the time to decipher them.

If you're guilty, more's the pity, because every report you write is another chapter in the formal history of your work. Whether two paragraphs long, or two hundred pages, it adds to the permanent record of what you've done in the past and what you want to do in the future.

The engineer or management man who can't write well is like a photographer whose camera has run out of film: He may know what is going on, but he doesn't have the equipment to bring his achievements into permanent focus. Unless he can put words together clearly and logically, he can't write effectively about his work. And, equally important, he loses a wonderful chance to put across his own proposals for the future. His words sabotage his ambitions.

Put the light out before you leave

ILLUMINATION IS REQUIRED TO BE EXTINGUISHED
BEFORE THESE PREMISES ARE CLOSED TO BUSINESS

—Sticker pasted on doors of New York buildings during World War II

THREE TESTS OF YOUR WRITING

- **Are at least two-thirds of the verbs active?**
- **Do all nouns have a single meaning?**
- **Do you mention yourself or another human?**

This article will show you how to make your reports more readable. It won't show you how to write them, but it will point out where most reports go wrong. If you learn to avoid certain practices, your writing will automatically improve.

Let's admit at once that report writing is difficult. Any kind of writing is difficult, whether it's a business letter, a novel, or a magazine article. Actions almost always come easier than words. You wouldn't have too much trouble showing someone how to drive an automobile. But try putting your actions onto paper, in such a way that your words convey as much direct information and as much precision as, say, the movement you make when you put your foot on the gas.

Most bad reports violate these three rules of good writing:

- Keep your language natural
- Get your main points across forcefully
- Build your report logically

This article examines the first of these three ingredients of good writing; a future article will discuss the other two. Behind each of them are certain proved-in-practice techniques that can help you to sidestep the traps that many report writers fall into. These techniques aren't difficult to grasp. You can apply them to your own writing—now. The important thing is to be aware of them when you sit down to write.

Natural language

The engineer—almost anyone in industry, for that matter—thrives on concrete, realistic acts and thoughts. In every aspect of his company's business—production, inventory, manufacturing costs, quality control, research—he wants more than anything else to solve this problem: What is the most practical way to do the job? To get the answer, he ruthlessly eliminates every abstraction, every excess bit of information, every superfluous function. He makes time studies, he schedules production runs, he sets up inventory-control systems, he programs machine-loading on a computer, he establishes quality-control systems, he devises maintenance rules. In short, he tries to reduce almost every manufacturing process to a workable formula.

What happens when he puts his actions into writing? His reports often violate every sacred tenet of his business philosophy. He is general rather than specific, abstract instead of concrete, over-cautious rather than forceful. His prose is dull, it never quite comes to life.

Here's a typical paragraph:

> At the present time the company is committed to the manufacture of a product qualitatively superior but numerically inferior to that of its principal competitor. This may be interpreted, based upon the present market, that selective selling techniques should be emphasized to maintain the company's excellent current competitive situation. Concurrently, other factors should be investigated, such as the availability of new and less costly materials, redesign of component parts to decrease cost of manufacture, and the feasibility of purchasing new equipment which will provide increased production without a sacrifice in quality.

This stuffed-shirt approach is impressively serious, but not at all easy to understand. The gain in pomposity is more than offset by a loss in clarity; the passage is ambiguous, it is wordy, and it raises as many questions in the reader's mind as it answers.

Now let's look at the way the writer might have expressed his thoughts if he had spoken them:

> We can't turn out as many mousetraps as Miracle Metals. But, by golly, we can make better ones. I still think there's a big market for a high-quality mousetrap. In my opinion, we ought to concentrate on selling to the guy who wants quality. Our sales backlog shows he's willing to pay for it. But over and above that, we ought to look into the way we build our mousetraps. Can't we use that new plastic I heard about the other day? It's a lot cheaper than what we're using now. Couldn't we streamline some of those oddball parts that take so much time to make? Maybe we should buy one of those new machines—you know, the one that turns out mousetraps twice as fast as the one we have now.

This conversational approach is much more natural, no matter how slangy it looks in print. It is also much easier to understand. It informs the reader, gives him a much more definite picture than the original. Does it not, then, better fulfill the main purpose of a report—to inform? The ideal report is one that every technically competent reader will interpret exactly the same way. When any two readers disagree, the report writer has failed to inform clearly.

Actually, this spoken version is not entirely suitable for written presentation. When we talk, we speak loosely, we tend to ramble. We also leave out a great deal of detail, because we know what the listener knows about the subject. The best report writing falls somewhere in between the two paragraphs quoted above—in this instance much nearer to the spoken than the written. A good report has the ingredients of good conversation, without the stuttering, the repetition, the looseness that the tongue is heir to.

If we can draw a moral from the passages we have quoted, it is this: Say exactly what you mean, and say it naturally. Mark Twain once expressed the same thoughts about his approach to writing: "I like the exact word, and clarity of statement, and here and there a touch of good grammar for picturesqueness."

Incidentally, notice that both passages take up roughly the same amount of space, although the conversation piece has almost half again as many words—shorter, more direct words. Clarity and preciseness often accompany brevity, but you can't make a report more understandable simply by cutting out superfluous words. It's a mistake to assume that short sentences are easier to understand than long sentences. They may be easier to *read*, but not necessarily easier to *understand*. And in reports, which include many technical details that aren't found in other forms of writing, the sentences often must be long to make good sense. It's a good idea to remember that reports aren't written primarily to be readable, but to communicate. If they are readable, so much the better. And good communication usually makes for good reading.

Three tests of your writing

If your reports don't communicate as well as they should, you're probably violating three closely related rules of good writing:

I. Verbs should be active, not passive.

II. Nouns should be concrete, not abstract.

III. Style should be personal, not impersonal.

Except for legal opinions and government reports, technical and scientific writing probably abuses these three rules more than any other type. The reasons why aren't difficult to find. Science and technology are impersonal by definition. Novelists write about people; engineers write about things. A technical report on, say, the operation of an electrical circuit usually describes not what people do to the circuit but what happens within the circuit. And engineers, like lawyers, have a powerful tendency to over-generalize when they put an opinion into words. Instead of ignoring the one-in-a-thousand exception to the idea they're expressing, they resort to the all-inclusive but abstract generalization.

As we shall see, abstract writing of this sort usually is passive, impersonal writing. Where one condition exists, the other two faults will usually be found. In the same sense, improving one will bring improvements in the others.

By taking the three tests explained below, you can check your technical writing. All you need is a pencil and a passage from a report you've written. One typewritten, double-spaced page will be long enough.

Active verbs

Test I—Underline every verb in the passage. If more than one-third of the verbs are passive, re-write the passage, so that at least two-thirds of the verbs are active.

In good writing direct, forceful, active verbs always outnumber passive verbs by a large ratio. Hamlet's "To be, or not to be" soliloquy has twenty-five verbs, only two of them passive. Lincoln's Gettysburg Address contains twenty-seven active verbs, only three passive. Of the fifteen verbs in the Twenty-Third Psalm, not one is passive.

Let's apply the test to the examples given in the text above. In the "gaseous prose" passage at the beginning of this article, there are five verbs—four of them are passive. If you underline every verb in the passage beginning "At the present time the company is committed . . ." you'll also find five verbs, only one of them ("will provide") active. Now underline each verb in the spoken version that immediately follows, and you'll see that not one single verb is passive.

Passive verbs aren't difficult to spot; any past tense of a verb, preceded by some form of *to be*, forms a passive verb. Here the subject *receives* the action expressed by the verb, instead of *initiating* the action (as with an active verb). The italicized verbs in the following sentences are passive:

John *was hit* by the ball.

The circuit *is closed* by a solenoid.

An agreement *has been reached* by the companies.

Below are the same three ideas, expressed with active verbs:

The ball *hit* John.

A solenoid *closes* the circuit.

The companies *have reached* an agreement.

Why is a paragraph with active verbs more readable than one in which passive verbs predominate? The answer is three-fold: Active verbs are more direct.

Keep your language natural—but don't overdo it

Active verbs tend, far more than passive verbs, to have personal (human) subjects. Finally, we traditionally find it easier to read sentences in which the subject does something, not sentences in which something is done to the subject.

Let's repeat the rule for this test: Underline each verb, then re-write the passage until at least two-thirds of the verbs are active. Ignore verbals like infinitives and participles in your count—underline only the true verbs. And count the so-called linking verbs (*seems, sounds, becomes, is, are, was, were, have been, will be,* and so forth) as active verbs. Actually, they are verbs of being instead of verbs of action, for they only link what comes before the verb with what comes after it. Count them as active verbs anyway. The important thing here is to segregate your passive verbs, then get rid of most of them.

When you consciously strive to write in the active voice, you'll find yourself doing far more than simply changing the form of the verb. Excess words disappear, and clarity improves. Too, sentence construction becomes much simpler. In each of the following examples, a strong active verb, buried within the original sentence in another form, replaces a weak passive verb:

Poor: A carbide toolbit *is used* to cut the steel.
Better: A carbide toolbit *cuts* the steel.

●

Poor: It *is expected* that supplies will arrive next week.
Better: Supplies *should arrive* next week.

●

Poor: Cleaning of the parts *is effected* by rinsing in hot water.
Better: A hot-water rinse *cleans* the parts.

Active verbs, then, have this effect: They force you to be more direct and less wordy. They give your sentences more force, hence more authority. And they produce a more natural language, one that follows the word patterns that you use in your conversation. If you don't believe this last point, re-read the above examples and then decide how you might have spoken them.

Concrete nouns

Test II—Underline every abstract noun in the passage you have selected for analysis. Re-write the passage to eliminate every abstract noun you can.

A concrete noun has only one meaning; an abstract noun can have several. Many abstract nouns have a

valid excuse for being, because they define broad, general concepts that can't be reduced to a single connotation: *Life, love, truth, democracy, justice* are all general, abstract words that each signify a set of conditions rather than a bald fact. They each sum up in one word a series of emotions and experiences.

Industry, like everything else, has a large vocabulary of abstract words. *Manufacturing, productivity, process, profit, research, cost, value, function, control, inventory, development, labor, analysis*—all are abstract. Unless they are qualified by some definite term of reference, no two readers will necessarily interpret any of these words exactly the same way.

Most badly written reports are far too abstract. Let's admit that all writing must include abstract words—up to a point. Some ideas simply can't be reduced to flat statements of fact. But the poor technical or business report is usually far more abstract than it need be. Ideally, every word in a technical report (in which the main goal is to communicate) should have exactly the same meaning for every reader.

Let's re-examine a passage quoted earlier. Just as it contains too many passive verbs, it also has far too many abstract nouns. Each of the italicized words is abstract (some more so than others); all these words could be replaced by more concrete nouns:

> At the present time the company is committed to the manufacture of a *product* qualitatively superior but numerically inferior to that of its principal *competitor*. This may be interpreted, based upon the present *market*, that selective selling *techniques* should be emphasized to maintain the company's excellent current competitive *situation*. Concurrently, other *factors* should be investigated, such as the *availability* of new and less costly *materials*, redesign of *component parts* to decrease *cost* of manufacture, and the feasibility of purchasing new *equipment* which will provide increased *production* without a sacrifice in *quality*.

What product? the reader asks. What competitor? What market? What situation? The spoken version that followed the original passage answers these questions with concrete words. The product is a mousetrap. The competitor is Miracle Metals. The market is the guy who wants high-quality mousetraps. The situation is the sales backlog. And so forth.

In this qualitatively-inferior-but-abstractly-superior passage, notice the words *techniques, factors, and feasibility*. These are abstractions that pop up in any type of writing — technical or not. Here are some others that a concrete report will avoid: *question, problem, condition, result, course, nature, circumstance, case, means*.

Abstract nouns, as we have pointed out, are ambiguous. They also offend in another way: These cloudy words often attract, by a kind of grammatical osmosis, certain awkward phrases that intensify the ambiguity already present: *by means of, with regard to, with respect to, in the case of, as to, in the nature of, on account of, for the purpose of, with reference to*. When an abstract noun is the subject of a sentence, this construction is likely to occur:

1. The situation in the case of the broken wrench was resolved by purchase of a new one.
2. The results of the test were such that a new lathe for the toolroom was indicated.
3. The problem with respect to the machine's breakdown was solved by replacement of the motor.

Let's analyze these three sentences: Main subjects are the abstract nouns *situation, results*, and *problem*. In each sentence, the writer is almost forced to follow the subject with an awkward, wordy phrase: *in the case of, such that, with respect to*. The writer also finds that passive verbs are preferable: *was resolved, was indicated, was solved*.

If we re-write these three sentences, replacing the abstract subjects with concrete nouns and the passive verbs with active ones, we get something like this:

1. They bought a new wrench to replace the broken one.
2. The tests showed that the toolroom needed a new lathe.
3. To repair the machine that broke down, we replaced the motor.

If these examples reveal nothing else, they show that abstract nouns and passive verbs have a strong affinity; each reinforces the weakness of the other.

One further point deserves mention here: In two of the three re-written sentences, a personal pronoun replaces the abstract noun that was originally the subject. As we shall see, the personal touch also helps make reports concrete and active.

Personal style

Test III—Whenever possible, mention yourself and other people. Keep your writing human.

The writer of a technical report faces one obstacle that many writers never even are aware of. Because he writes about things, usually, instead of people, he feels a strong urge to be impersonal. Novelists and playwrights never have to worry about losing the personal touch. And when a journalist writes a news story, he never forgets that it is people who make news. The technical writer should also remember this rule: Things may be important, but people have to make these things.

It's not hard to be impersonal. To illustrate, let's rewrite the preceding (very personal) paragraph:

> There is one obstacle in a technical report that does not exist in other forms of writing. Because it is about things instead of people, it tends to be impersonal. It is seldom that the personal touch is lacking in a novel or play. And in a news story, it is people who make news. The rule should be reflected in a technical report: Things may be important, but it is people who make these things.

This impersonal version still has people in it (three times), but there are two new elements: The impersonal pronoun *it* is now dominant, and the verbs are less forceful. Most people would also agree that the new version is a great deal duller to read.

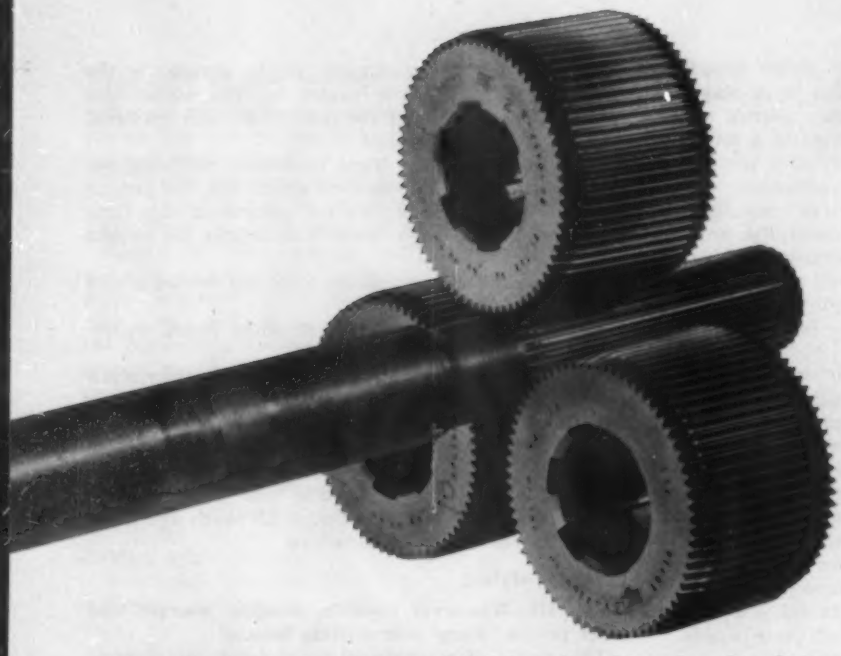
One rule to remember: Get into the habit of emphasizing the human and de-emphasizing the *it*. The man who writes "It is recommended" makes a suggestion; the man who writes "I recommend" speaks as an authority.

"But how can I be personal about a machine, or an electronic circuit, or an inventory-control system, or production equipment?" the technical reporter may well ask. The answer is that you can't always be personal about everything. But the human background does exist: Machines need operators, electronic circuits need designers, systems need engineers, and equipment needs a company—a group of humans.

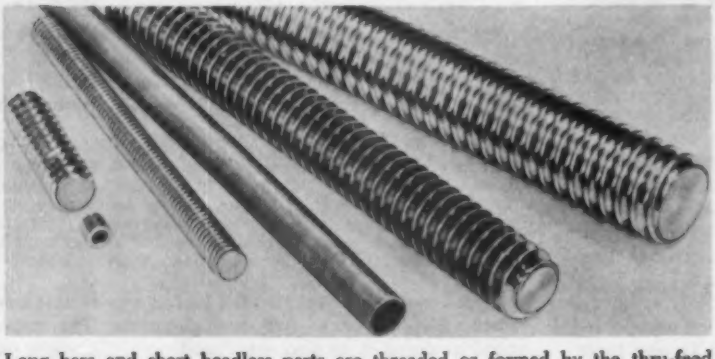
This plea for a personal style is a plea for more natural writing. You would never say to a secretary, "It is a phone call that is expected." Obviously, you would say the far more direct "I'm expecting a phone call." Why? Because it's more natural, because the meaning is clearer, and because you like to talk about yourself.

Thread rolling

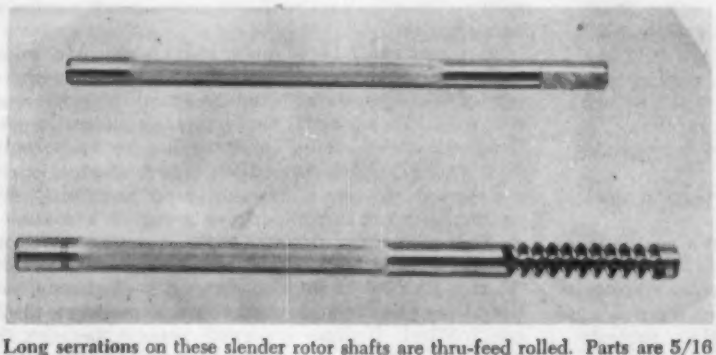
By Clifford T Appleton,
vice president, general sales mgr,
Reed Rolled Thread Die Co,
Holden, Mass



Spline rolling on this forged alloy-steel shaft is performed in a three-die spline-rolling machine, with the spline teeth being formed progressively as the blank feeds through the machine. Illustration shows relationship of dies and shaft (1 7/32 in. dia, 28 teeth) as it would be in the machine. Production rate is seven pc/min



Long bars and short headless parts are threaded or formed by the thru-feed method. The recirculating ball screw (far right) can be formed at a rate of eight in. per min in sizes up to 3 in. dia. Former manufacturing technique for this 4140-alloy-steel screw called for rough hobbing and finish grinding



Long serrations on these slender rotor shafts are thru-feed rolled. Parts are 5/16 in. dia and are serrated over a length of approximately 3 in. Production rate is 12 pc/min. Straight, diagonal and diamond knurls can also be rolled

oday's metalworking headlines spotlight such processes as explosive forming, ultra-high-speed machining, numerical control—and well they should. These are some of the hottest topics of the moment. But let's look for a moment at a process that has been with us for over one hundred years—thread rolling.

The thread and form rolling process, old as it is, has grown considerably in recent years because of the many advantages and economies it offers in the production of precision threads and forms. Rolled threads are stronger, more accurate, and have a higher degree of surface finish than cut threads. And they can be uniformly produced at high rates without wasting material.

But it's the versatility of the process that is of interest here. In addition to its wide application in fastener production (this is where it began), the rolling process is capable of many non-fastener, even non-threading, operations. Let's run through a few of them.

Knurling

Thread rolling machines can produce straight, diagonal, and diamond knurling. The diameter of the work with straight or diagonal knurling is larger than the unknurled blank by an amount approximately equal to the tooth depth of the knurl used. The diameter of knurling with a male diamond pattern (raised points) is slightly larger, but with a female diamond is slightly smaller.

Splines and serrations

External involute splines and serrations (top left, bottom left) are easily rolled. Splines and serrations are similar in many respects. The basic tooth form for both has an involute profile and is based on diametral pitch. Major differences are in the pressure angles (30° for the spline, 45° for the serration), range of pitches, range of diameters, uses, and classes of fits. Splines are most often used where axial movement is required with rotation. Serrations are used more for fixed-position fastening.

For a given diameter, finer pitches roll easier than coarser pitches. A

...but not always threads

larger number of teeth permits better tracking of dies on the blank and puts less strain on the die teeth. Preferred design of rolled splines and serrations should, where possible, call for more teeth than the minimum required for rolling. Under some conditions shallower teeth are also specified in the interest of rolling economies.

Grooves

Rolling is ideal for forming grooves in cylindrical parts. Oil grooves, for example, can be rolled in the surfaces of shafts prior to the final operation. Such grooves have proved very satisfactory because of their low cost and smooth finish.

Burnishing

When fitted with flat or smooth formed dies, rolling machines can be used to burnish parts that have been preformed on lathes or screw machines. Actually, every rolling operation provides some burnishing.

Non-uniform leads

It is possible to roll threaded parts with pilot threads that are axially displaced a few thousandths of an inch from helical continuity with the rest of the threads.

Metal stampings

Threads on metal stampings can be rolled easily because of the ductility of the material used for stampings. In many instances, thinner metal can be used because the diameter of the portion to be threaded need only be made to the approximate pitch diameter of the thread. No reduction is necessary on the corresponding inside diameter.

Hollow parts

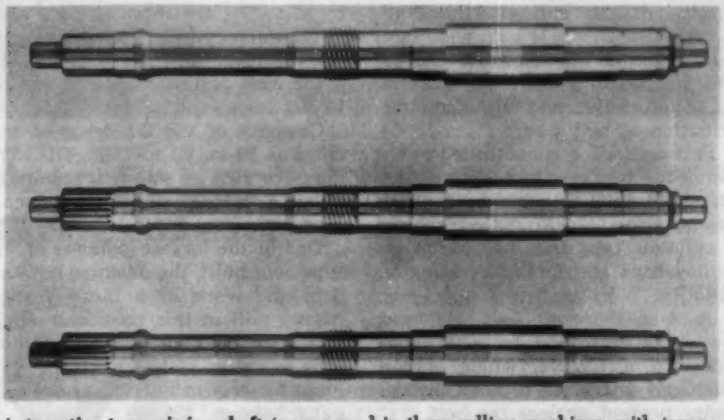
Hollow cylindrical parts can be threaded either by forging the thread in the usual manner, or by crimping the entire wall should it be very thin (top right). For a crimped thread, a threaded mandrel is synchronized with the dies so grooves on dies and mandrel will mate.

Sizes and materials

Parts ranging from 0.060 to 4½ in. diameter, with two to 80 threads per inch, can be rolled on existing equipment. For parts outside these limits, special machines are usually necessary.

Thread or form rolling is feasible on practically all malleable materials of hardnesses through Rh 40C and, in some cases, even harder. Die life, however, will vary widely. Dies will produce several million pieces per setting on soft ductile materials, maybe only a few thousand on harder materials.

Practically all of the commonly used carbon and alloy steels, including stainless and tool steels, can be rolled successfully. Nonferrous metals, including brass, bronze, aluminum, copper, beryllium copper, titanium, nickel, silver, gold, Monel, and some die-casting alloys are also rolled in regular production runs. Magnesium, molybdenum, zirconium, powder metals, and some plastics have also been rolled, but with varying success.



Automotive transmission shaft is processed in three rolling machines, with transfer mechanisms between the machines. First machine forms the 24-DP speedometer worm; second, the 19.47-DP spline; and the third, the ¾-16 UNF-2A thread. SAE 4024 steel shafts are produced at a rate of seven pc/min

Hollow cylindrical parts are rolled with forged or crimped threads, depending upon wall thickness. The sink strainer (top) has a rounded thread form that was crimped because of the very thin wall. Production rate for this piece, in brass or stainless, is six pc/min

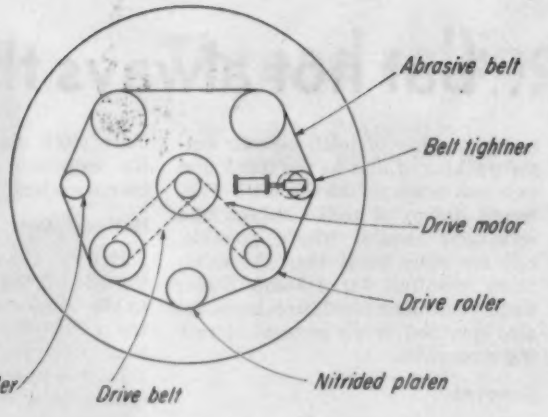
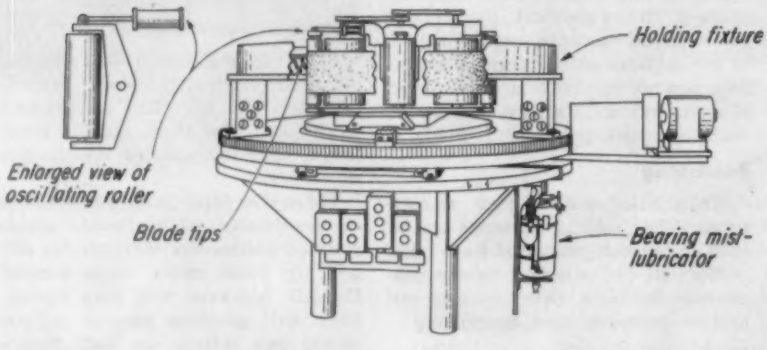


Table holding work (stator ring) rotates at 3 rpm in direction opposite to that of abrasive belt mounted on ram in center. Ram feed for grinding is controlled by lead screw coupled to a ratio motor.



Cheaper, faster output of turbine components results when . . .

Belts grind buckets and blades

By Leo F Byrnes
General Electric Co Pittsfield, Mass

Gas turbines are getting bigger and bigger today as new applications are found for them. Now, the machines that produce such turbine components as buckets and blades must grow in proportion to the size of the turbines themselves. For example, General Electric has found that conventional wheel grinding of the inside and outside diameters of assembled turbine buckets and blades is no longer adequate.

For this reason, GE has turned to belt grinding to do the job, finding that it is not only faster than conventional wheel grinding, but is cheaper because belts cost less than wheels, and they don't have to be balanced. Costly automatic wheel dressers are eliminated, too.

Another reason, and an important one, why GE chose belt over wheel grinding is that a buildup in tolerances sometimes causes blades to loosen in an assembled stator ring. A loose blade can chip a grinding wheel so badly that it has to be redressed, but it has no effect on an abrasive belt that is backed by a platen at the grinding contact.

To accomplish the switchover in grinding methods, GE designed and built an abrasive belt grinder that is radically new in concept. A shaper-type ram, with full-length gibs ground to fine tolerances, is mounted in the center of a base table. Pulleys are mounted vertically on ram.

Each of the pulleys (there are seven in all) has a 14-inch-wide face, which allows the narrower belt to oscillate up and down for full use of the abrasive, and for equal distribution of belt wear.

Belt oscillation is controlled as the belt edge touches Carboloy contacts on microswitches, which energize a solenoid-operated air valve, causing a cylinder (see drawing) to tip the pulley back and forth, reversing oscillation.

A 4-in.-diameter belt tightener pulley is controlled by a solenoid-operated air valve, which is continuously energized to keep the cylinder pressed against the belt.

Ram feed for grinding is controlled by a lead screw coupled to a ratio motor. Feed is constant at 0.002 in. per revolution of table (table turns at 3 rpm). Stock is thus removed at 0.012 ipm on diameter.

Grinding fixtures are mounted on the rotating table, which is supported by a mist-lubricated, sealed Kaydon bearing. Ram (on which pulleys are mounted) turns opposite to rotation of the abrasive belt.

Angles on blade tips are ground by elevating the rotating table with a hydraulic cylinder. Set blocks under the table vary the angles of the blade tips, which must be ground to accuracies of +0.005, –0.000 in.

Capacity of the GE-designed machine is 36 in. ID to 72-in. OD. The abrasive belt is 36 grit aluminum oxide, 8 inches wide by 107 inches long, operates at 5000 sfm.

One of the largest grinders of this type ever built, the machine not only does the work of a large vertical boring mill in this particular application, it does so faster and more economically. GE engineers estimate the new grinder saves the company about $25,000 a year in operating costs, and it has saved a further $5000 by eliminating the need for elaborate fixtures.

A PANEL DISCUSSION ON GAGING SCREW THREADS

Back to School at Greenfield

Yes, these are Distributors' salesmen "going to school" at the factory for a concentrated work course in Tapping, Drilling, and Gaging of Screw Threads. A course crammed with information that would take a man years of field work to gather.

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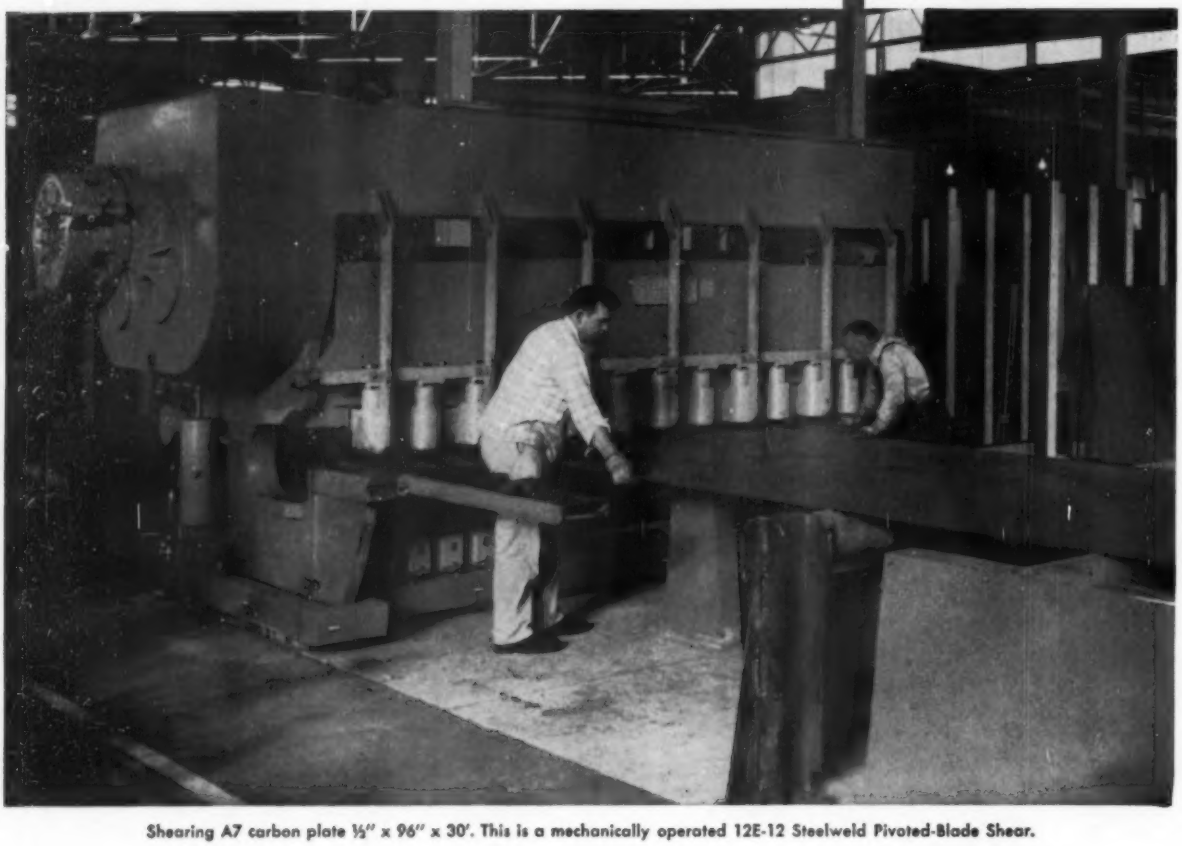
GREENFIELD TAP & DIE GREENFIELD, MASSACHUSETTS

METALS WAREHOUSE CHOOSES STEELWELD SHEAR



Shearing A7 carbon plate ½" x 96" x 30'. This is a mechanically operated 12E-12 Steelweld Pivoted-Blade Shear.

Proves Highly Advantageous in New Berkeley Warehouse of Ducommun Metals & Supply Co.

VERSATILITY, speed, accuracy and ease of operation were dominant factors that led Ducommun Metals & Supply Co. to select a Steelweld Shear for its new metals warehouse in Berkeley, California.

Write for free MECHANICAL SHEAR CATALOG No. 2011 or HYDRAULIC SHEAR CATALOG No. 2030

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PIVOTED BLADE Mechanical and Hydraulic **SHEARS**

Steelweld Machinery includes: Mechanical & Hydraulic Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

Ducommun's report on the shear follows:

1. **Used for:** A7 plate 3/16" to ¾" x 12 ft.
   Aluminum plate 3/16" to ¾" x 12 ft.
   Stainless plate ⅛" to ½" x 12 ft.
   Brass & Copper 3/16" to ¾" x 8 ft.
2. An important advantage is ease of shearing a wide variety of types and sizes of metals each day from thin narrow strips to heavy, wide plates. The knife clearance adjustment, plus the fast and accurate power back gage, makes changes from one thickness and size to another very fast, yet permits us to produce high quality shearing.
3. Another reason for selecting the Steelweld Shear was the low rake angle of the blade. This permits flatter shearing.
4. The power back gage offers a plus factor in that we can use it in conjunction with our front feed rolls to back off plate for accurate alignment when shearing to a front gage.
5. When the Steelweld Shear was being installed, our sheet shear was being re-located in the warehouse, and we could not shear an order for 26 gage stainless. With the Steelweld knife clearance adjustment, we were able to shear the material very accurately with a minimum of burr.
6. Operator is very pleased with ease of operation and the many adjustments available.

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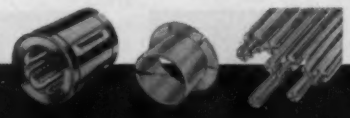

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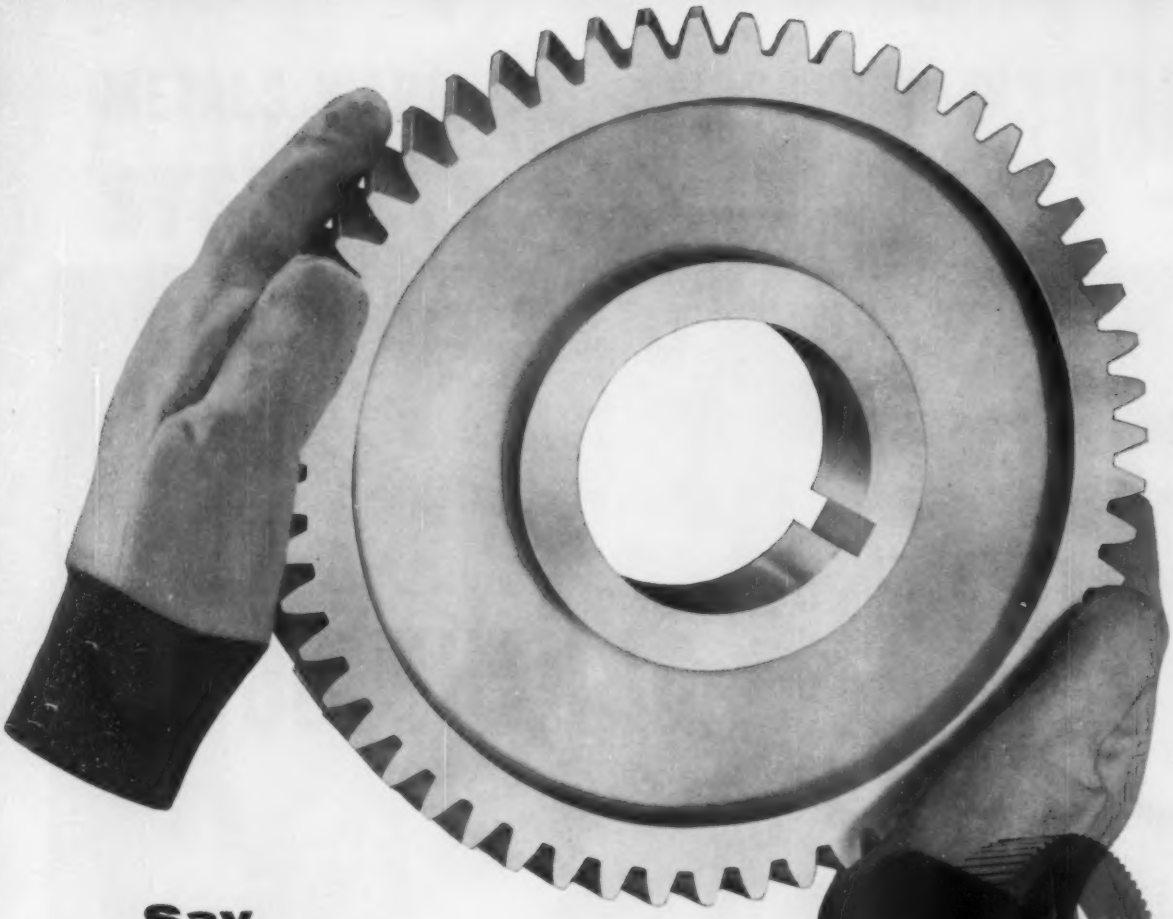

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Comparison Chart for Solid-Carbide Burrs—I

By reference to this comparison chart (see also pages 125 and 127) the user can obtain the same carbide burr from any of the 12 member firms in the Solid Carbide Tool Institute without confusion over catalogue designations. The column headed SCTI represents the industry designation, the succeeding columns the designations currently employed by the burr manufacturers.

Member firms of SCTI are:

The Atrax Co
240 Day St
Newington, Conn

Dixie Tool Industries, Inc
4555 W Franklin St
Bridgeport, Mich

Elgin National Watch Co
Abrasives Div
107 National St
Elgin, Ill

Essex Rotary File & Tool Corp
295 Madison Ave
New York 17, N Y

M. A. Ford Manufacturing Co
1545 Rockingham Rd
Davenport, Iowa

Fullerton Tool Co
121 Perry St
Saginaw, Mich

Grobet File Co. of America, Inc
750 Washington Ave
Carlstadt, N J

Jarvis Corp
Middletown, Conn

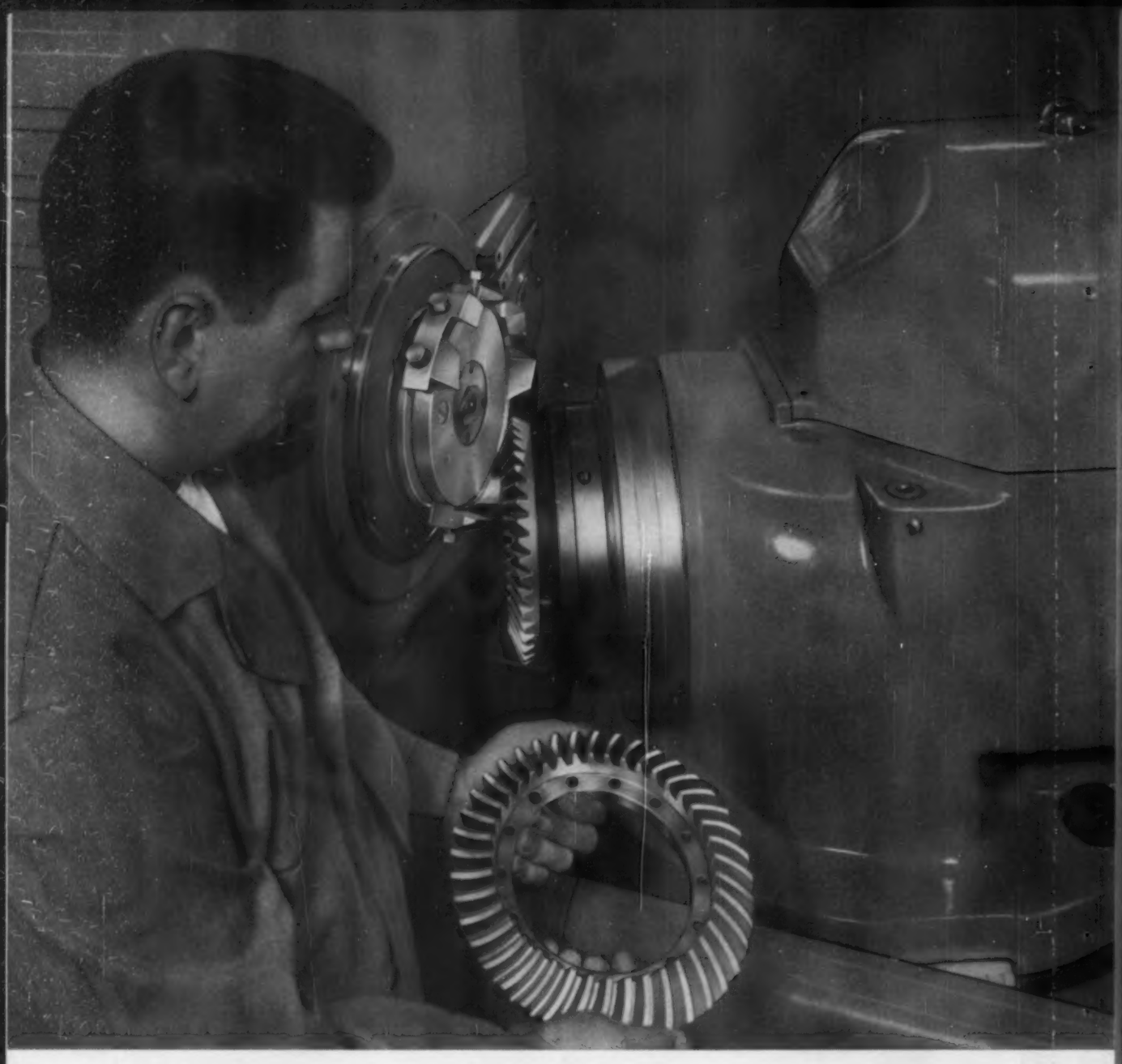
Metal Removal Co
1801 West Columbia Ave
Chicago 26, Ill

Pratt & Whitney Co, Inc
Charter Oak Boulevard
W Hartford 1, Conn

Rotary Tool Industries, Inc.
4461 W Jefferson Ave
Detroit 9, Mich

Dexco Corp, Raymac Div
15490 Dale Ave
Detroit 23, Mich

Size	SCTI	Atrax	Dixie	Elgin	Essex	Ford	Fullerton	Grobet	Jarvis	Metal Removal	Pratt & Whitney	Raymac	Rotary
Cylindrical Plain Burrs													
1/4 × 5/8	SA-1	A-105	4-10A	SA-1		CICH	X-17	A61W	TC-01	CB41-1/4	20A13	D-1-4	101-C
5/16 × 3/4	SA-2	A111	5-12A	SA-2	ETC30				TC-02A	CB41-5/16		SA-2	SA-2
3/8 × 3/4	SA-3	A121	6-12A	SA-3	ETC31	CIEJ	X18	A10KW	TC-02	CB41-3/8	30AW	D-6-6	TI-EJ
7/16 × 1	SA-4	A131	7-16A	SA-4	ETC32				TC-02B	CB41-7/16		SA-4	SA-4
1/2 × 1	SA-5	A141	8-16A	SA-5	ETC33	CIGN	X19	A13PW	TC-03	CB41-1/2	40AW	D-8-8	TI-GL
5/8 × 1	SA-6	A161	10-16A	SA-6	ETC34	CIHN	X116		TC-04	CB41-5/8		D-10-8	TI-IL
3/4 × 1	SA-7	A185	12-16A	SA-7			X73		TC-04B	CB41-3/4	60-A7-W	SA-7	SA-7
7/8 × 1	SA-8		14-16A	SA-8						CB41-7/8	70-A2-W	SA-8	SA-8
1 × 1	SA-9	A201	16-16A	SA-9	ETC38				TC-05	CB41-1		SA-9	SA-9
1/8 × 5/8	SA-11	A103		SA-11			X50			CB41-1/8		SA-11	SA-11
1/8 × 5/8	SA-12		2-10A4	SA-12					TC-01A	SB41-1/8		SA-12	SA-12
5/32 × 5/8	SA-13	A15	5/32A4	SA-13					TC-01G	CB41-5/32		SA-13	SA-13
3/16 × 5/8	SA-14	A23	3-10A4	SA-14					TC-01B	CB41-3/16		SA-14	SA-14
3/4 × 1/2	SA-15	A182	12-8A	SA-15	ETC35				TC-04G	CB41-3/4		SA-15	SA-15
3/4 × 3/4	SA-16	A184	12-12A	SA-16	ETC36		X20		TC-04A	CB41-3/4		SA-16	SA-16
Cylindrical End-Cutting Burrs													
1/4 × 5/8	SB1	B105	4-10B	SB-1		CICH	X17E	B61W	TC-01	CB41-1/4	20AE13	E-1-4	SB-1
5/16 × 3/4	SB2	B111	5-12B	SB-2	ETC30				TC-02A	CB41E-5/16		SB-2	SB-2
3/8 × 3/4	SB3	B121	6-12B	SB-3	ETC31	CIEJ	X18E	B10KW	TC-02	CB41E-3/8	30AEW	E-6-6	SB-3
7/16 × 1	SB4	B131	7-16B	SB-4	ETC32				TC-02B	CB41E-1/16		SB-4	SB-4
1/2 × 1	SB5	B141	8-16B	SB-5	ETC33	CIGN	X19E	B13PW	TC-03	CB41E-1/2	40AEW	E-8-8	SB-5
5/8 × 1	SB6	B161	10-16B	SB-6	ETC34	CIHN	X116E		TC-04	CB41E-5/8		E-10-8	SB-6
3/4 × 1	SB7	B185	12-16B	SB-7			X73E		TC-04B	CB41E-3/4	60AE7W	SB-7	SB-7
7/8 × 1	SB8		14-16B	SB-8						CB41E-7/8	70AE2W	SB-8	SB-8
1 × 1	SB9	B201	16-16B	SB-9	ETC38				TC-05	CB41E-1		SB-9	SB-9
1/8 × 5/8	SB11	B103		SB-11			X50E		TC-01A	CB41E-1/8		SB-11	SB-11
1/8 × 5/8	SB12		2-10B4	SB-12						SB41E-1/8		SB-12	SB-12
5/32 × 5/8	SB13	B15	5/32B4	SB-13					TC-01G	CB41E-5/32		SB-13	SB-13
3/16 × 5/8	SB14	B23	3-10B4	SB-14					TC-01B	CB41E-3/16		SB-14	SB-14
3/4 × 1/2	SB15	B182	12-8B	SB-15	ETC35				TC-04G	CB41AE-3/4		SB-15	SB-15
3/4 × 3/4	SB16	B184	12-12B	SB-16	ETC36		X20E		TC-04A	CB41BE-3/4		SB-16	SB-16



Helixform*—a new method for bevel gear production!

The new No. 112 Hypoid Helixform Gear Finisher assures improved quality and increased production on spiral bevel and hypoid non-generated ring gears up to 10½" in diameter, and 2½ DP such as employed in passenger car axles.

The Helixform Cutting Method used on this machine offers these advantages:

Conjugate tooth surfaces, minimized gear development, complete control of tooth bearing, and greater adjustability in final assembly.

We will be glad to send a bulletin giving further details on request. Ask for literature on the No. 112 Hypoid Helixform Gear Finisher and the companion No. 112 Hypoid Gear Rougher. Write for it today.

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Comparison Chart for Solid-Carbide Burrs—II

Size	SCTI	Atrax	Dixie	Elgin	Essex	Ford	Fullerton	Grobet	Jarvis	Metal Removal	Pratt & Whitney	Raymac	Rotary
Cylindrical Radius-End Burrs													
1/4 × 5/8	SC1	C105	4-10C	SC-1		C2CH	X21	C61W	TC-06	CB42-1/4	20D13W30	C-1-4	103-C
5/16 × 3/4	SC2	C111	5-12C	SC-2	ETC20				TC-07A	CB42-5/16		SC-2	SC-2
3/8 × 3/4	SC3	C121	6-12C	SC-3	ETC21	C2EJ	X22	C10KW	TC-07	CB42-3/8	30DW34	C-6-6	T3-EJ
7/16 × 1	SC4	C131	7-16C	SC-4	ETC22				TC-07B	CB42-7/16		SC-4	SC-4
1/2 × 1	SC5	C141	8-16C	SC-5	ETC23	C2GN	X24	C13PW	TC-08	CB42-1/2	40DW36	C-8-8	T3-GL
5/8 × 1	SC6	C161	10-16C	SC-6	ETC24	C2HN	X49	C16PW	TC-09	CB42-5/8	50DW38	C-10-8	T3-IL
3/4 × 1	SC7	C181	12-16C	SC-7	ETC25				TC-09A	CB42-3/4	60DW	SC-7	SC-7
1 × 1	SC9		16-16C	SC-9						CB42-1		SC-9	SC-9
1/8 × 1/2 S.S.	SC11	C5		SC-11	ETC17				TC-06A	SB42-1/8		SC-11	SC-11
1/8 × 1/2	SC12			SC-12			X48			CB42-1/8		SC-12	SC-12
5/32 × 5/8	SC13	C7	5/32C-4	SC-13					TC-06G	CB42-5/32		SC-13	SC-13
3/16 × 5/8	SC14	C23	3/16C-4	SC-14					TC-06B	CB42-3/16		SC-14	SC-14
Ball Burrs													
1/4	SD1	D105		SD-1	ETC9	C3C	X5	D6CW	TC-12	CB48-1/4	20F13W30	B-1-4	102-C
5/16	SD2	D113	5-5B	SD-2	ETC10		X53		TC-13	CB48-5/16		SD-2	SD-2
3/8	SD3	D121		SD-3	ETC11	C3E	X6	D10DW	TC-14	CB48-3/8	30FW34	B-6	T2-E
7/16	SD4	D131	7-7B	SD-4	ETC12				TC-14A	CB48-7/16		SD-4	SD-4
1/2	SD5	D141		SD-5	ETC13	C3G	X7	D13FW	TC-15	CB48-1/2	40FW36	B-8	T2-O
5/8	SD6	D161		SD-6	ETC14	C3H	X8	D16HW	TC-16	CB48-5/8	50FW38	B-10	T2-I
3/4	SD7	D181	12-12B	SD-7	ETC15	C3J	X9	D19JW	TC-17	CB48-3/4	60FW40	SD-7	T2-J
7/8	SD8		14-14B	SD-8						CB48-7/8		SD-8	SD-8
1	SD9	D201	16-16B	SD-9	ETC16		X10	D25NW	TC-18	CB48-1	80FW	SD-9	SD-9
1/8 S.S.	SD11	D103		SD-11					TC-10	SB48-1/8		SD-11	SD-11
1/8	SD12		2-2B-4	SD-12	ETC7		X51			CB48-1/8		SD-12	SD-12
3/16 S.S.	SD13	D22		SD-13					JD-22	SB48-3/16		SD-13	SD-13
3/16	SD14	D24	3-3B-4	SD-14	ETC8		X52		TC-11	CB48-3/16		SD-14	SD-14
Oval Burrs													
1/4 × 3/8	SE1	E105	4-6Q	SE1					TC-21	CB46-1/4		A-1-4	107-C
3/8 × 5/8	SE3	E121	6-10Q	SE3	ETC56		X56		TC-22	CB46-3/8	30GW34	A-6-5	C-50
1/2 × 7/8	SE5	E141	8-14Q	SE5	ETC57	C4GK	X2	E13MW	TC-23A	CB46-1/2	40GW36	A-8-7	C-51
5/8 × 1	SE6	E161	10-16Q	SE6	ETC58	C4HN	X3	E16PW	TC-24	CB46-5/8	50GW38	A-10-8	C-52
3/4 × 1	SE7	E181	12-16Q	SE7	ETC59		X57		TC-25	CB46-3/4	60GW40	SE-7	SE-7
3/16 × 5/16	SE11		3-5Q-4	SE11			X544			CB46-3/16		SE-11	SE-11
Tree Radius-End Burrs													
1/4 × 5/8	SF1	H105	4-10R	SF1	ETC68	C5CH		L61W	TC-26E	CB43-1/4	20P13W30	TR-1-4	104-C
3/8 × 3/4	SF3	H121	6-12R	SF3	ETC69		X12		TC-27A	CB43-3/8	30PIW34	TR-6-6	T4-EJ
1/2 × 1	SF5	H141	8-16R	SF5	ETC70	C5GN	X13	L13PW	TC-28	CB43-1/2	40PW36	TR-8-8	T4-GL
5/8 × 1	SF6	H161	10-16R	SF6	ETC71		X113		TC-28C	CB43-5/8	50PW38	TR-10-8	T4-IL
3/4 × 1	SF7	H182		SF7	ETC72		X15		TC-29B	CB43-3/4	60PW40	SF-7	SF-7
7/8 × 1 1/4	SF8		14-20R	SF8						CB43-7/8	70PW	SF-8	SF-8
1/8 × 1/2 S.S.	SF11	H3		SF11					TC-26A	SB43-1/8		SF-11	SF-11
1/8 × 1/2	SF12		2-8R-4	SF12	ETC67					CB43-1/8		SF-12	SF-12
1/2 × 3/4	SF13		8-12R	SF13						CB43A-1/2	40P2W	TR-8-8	SF-13
3/4 × 1 1/4	SF14	H181	12-18R	SF14	ETC73				TC-29A	CB43B-3/4	60PW	SF-14	SF-14
3/4 × 1 1/2	SF15	H183	12-24R	SF15	ETC74				TC-29D	CB43C-3/4		SF-15	SF-15
1 1/8 × 2	SF16		18-32R	SF16						CB43-1 1/8	90P2W	SF-16	SF-16
7/15 × 1	SF-4			SF-4					TC-27B				
Flame Burrs													
5/16 × 3/4	SH2	G111		SH2	ETC51				TC-52	CB51-5/16		SH-2	SH-2
1/2 × 1 1/4	SH5	G141		SH5	ETC52				TC-53	CB51-1/2	40MW	SH-5	T12-GN
5/8 × 1 7/16	SH6	G161		SH6	ETC53				TC-54	CB51-5/8	50MW	SH-6	T12-IO
3/4 × 1 5/8	SH7	G181		SH7	ETC54				TC-55	CB51 3/4	60MIW	SH-7	T12-JQ

UNIVERSAL R & R DEBURRING TOOLS

with spring-loaded retractable blade give precision-cut edge or chamfer at high speed without chatter

Adjustable spring tension allows continuous contact with work-piece to eliminate chatter at high operating speeds. Free-floating blade permits self-alignment and uniform stock removal. Made in a full range of sizes to 1½" diameter.

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Comparison Chart for Solid-Carbide Burrs—III

Size	SCTI	Atrax	Dixie	Elgin	Essex	Ford	Fullerton	Grobet	Jarvis	Metal Removal	Pratt & Whitney	Raymac	Rotary
Tree Pointed Burrs													
1/4 × 5/8	SG1	K105	4-10T	SG1	ETC60	C6CH		K61W	TC-62	CB44-1/4	20R13W30	TP-1-4	10-5-C
5/16 × 5/8	SG2	K111	5-10T	SG2					TC-62A	CB33-5/16		SG-2	SG-2
3/8 × 3/4	SG3	K121	6-12T	SG3	ETC61	C6EJ	X35		TC-64	CB44-3/8	30RW34	TP-6-6	T5-EJ
1/2 × 1	SG5	K142	8-16T	SG5	ETC63	C6GN	X37		TC-67	CB44-1/2	40RW36	TP-8-8	T5-GL
5/8 × 1	SG6	K161	10-16T	SG6	ETC64		X46		TC-68	CB44-5/8	50R1W	TP-10-8	SG-6
3/4 × 1	SG7	K182	12-16T	SG7	ETC65				TC-69	CB44-3/4		SG-7	SG-7
1/2 × 3/4	SG13	K141	8-12T	SG13	ETC62		X36	K13KW	TC-65	CB44A-1/2	40RW	SG-13	T5-GJ
3/4 × 1 1/2	SG15	K183	12-24T	SG15	ETC66				TC-69A	CB44B-3/4			SG-15
Taper or 60° Cone Burrs													
1/4	SJ1	M105	4-D-60	SJ1	ETC45				TC-34T	CB50-1/4	20W13W	SJ-1	109-C
3/8	SJ3	M121	6-D-60	SJ3	ETC46				TC-35T	CB50-3/8	30WW	X-6	T8-E
1/2	SJ5	M141	8-D-60	SJ5	ETC47		X72		TC-36T	CB50-1/2	40WW36	X-8	T8-G
5/8	SJ6	M161	10-D-60	SJ6	ETC48		X71		TC-37T	CB50-5/8	50W2W	X-10	T8-I
3/4	SJ7	M181	12-D-60	SJ7	ETC49		X62		TC-38T	CB50-3/4	60WW	SJ-7	SJ-7
7/8	SJ8		14-D-60	SJ8						CB50-7/8	70WW42	SJ-8	SJ-8
1	SJ9	M201	16-D-60	SJ9	ETC50				TC-39T	CB50-1"		SJ-9	SJ-9
Taper or 90° Cone Burrs													
1/4	SK1	R105	4-D-90	SK1	ETC39				TC-34S	CB49-1/4		SK-1	110-C
3/8	SK3	R121	6-D-90	SK3	ETC40				TC-35S	CB49-3/8		Z-6	T9-E
1/2	SK5	R141	8-D-90	SK5	ETC41		X70		TC-36S	CB49-1/2	40WIW	Z-8	T9-G
5/8	SK6	R161	10-D-90	SK6	ETC42		X68		TC-37S	CB49-5/8	50WIW	Z-10	T9-I
3/4	SK7	R181	12-D-90	SK7	ETC43		X63		TC-38S	CB49-3/4	60WIW	SK-7	SK-7
7/8	SK8			SK8						CB49-7/8	70WIW	SK-8	SK-8
1	SK9	R201		SK9	ETC44				TC-39S	CB49-1"		SK-9	SK-9
14° Cone Round-End Burrs													
1/4 × 5/8	SL1	U105	4-10H	SL1	ETC2				TC-74A	CB47-1/4		SL-1	106-C
5/16 × 7/8	SL2	U111		SL2	ETC3	C7RDK			TC-74	CB47-5/16		SL-2	T7-DK
3/8 × 1 1/16	SL3	U121	6-17H	SL3	ETC4	C7REN			TC-75	CB47-3/8	30UW34	SL-3	T7-EL
1/2 × 1 1/8	SL4	U141	8-18H	SL4					TC-77	CB47-1/2	40UW36	SL-4	T7-GM
5/8 × 1 3/16	SL5		10-19H	SL5				Q16RW		CB47-5/8		SL-5	SL-5
5/8 × 1 5/16	SL6	U161	10-21H	SL6					TC-78	CB47A-5/8		SL-6	T7-IN
3/4 × 1 1/2	SL7	U183	12-24H						TC-79	CB47-3/4	60UIW40		T7-JP
Taper or Cone Burrs													
1/4 × 1/2 22°	SM1	L105	48L	SM1			X28		TC-35	CB45-1/4		SM-1	SM-1
1/4 × 3/4 14°	SM2	L104	4-12L	SM2			X29		TC-35A	CB45A-1/4		SM-2	SM-2
1/4 × 1 10°	SM3	L108		SM3			X59		TC-35B	CB45-1/4		SM-3	SM-3
3/8 × 5/8 28°	SM4	L121	6-10L	SM4					TC-36	CB45-3/8		SM-4	SM-4
1/2 × 7/8 28°	SM5	L141	8-14L	SM5			X31		TC-37	CB45-1/2		SM-5	SM-5
5/8 × 1 31°	SM6	L161		SM6			X32		TC-37A	CB45-5/8		SM-6	SM-6
Inverted Cone Burrs													
1/4 × 5/16 10°	SN1	S105	4-5N	SN1					TC-42	CB52-1/4		SN-1	108-C
3/8 × 3/8 13°	SN2		6-6N	SN2						CB52-3/8		SN-2	SN-2
1/2 × 1/2 16°	SN3		8-8N	SN3						CB52-1/2		SN-3	SN-3
1/2 × 1/2 28°	SN4	S141		SN4					TC-43	CB52-1/2		SN-4	SN-4
5/8 × 5/8 19°	SN5		10-10N	SN5						CB52-5/8		SN-5	SN-5
5/8 × 3/4 18°	SN6	S161	10-12N	SN6					TC-44	CB52A-5/8		SN-6	SN-6
3/4 × 5/8 30°	SN7	S181	12-10N	SN7					TC-45	CB52-3/4		SN-7	SN-7
3/4 × 3/4 21°	SN8		12-12N	SN8						CB52-3/4		SN-8	SN-8

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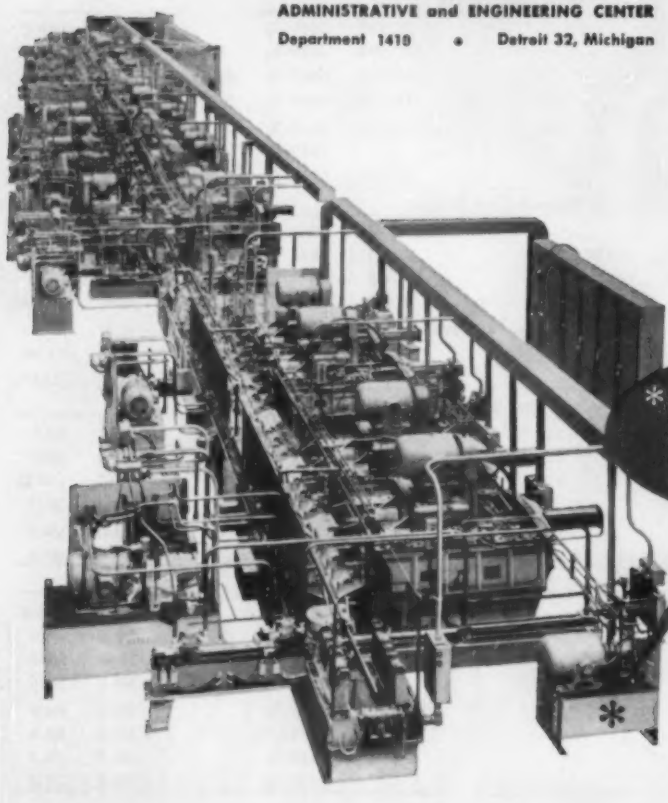
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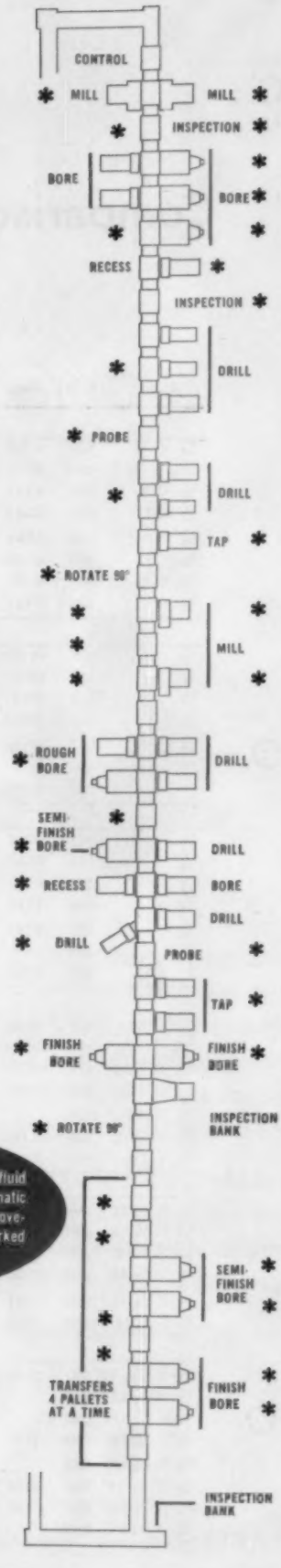

Comparison Chart for Solid-Carbide Burrs—II

Size	SCTI	Atrax	Dixie	Elgin	Essex	Ford	Fullerton	Grobet	Jarvis	Metal Removal	Pratt & Whitney	Raymac	Rotary
Cylindrical Radius-End Burrs													
1/4 × 5/8	SC1	C105	4-10C	SC-1		C2CH	X21	C61W	TC-06	CB42-1/4	20D13W30	C-1-4	103-C
5/16 × 3/4	SC2	C111	5-12C	SC-2	ETC20				TC-07A	CB42-5/16		SC-2	SC-2
3/8 × 3/4	SC3	C121	6-12C	SC-3	ETC21	C2EJ	X22	C10KW	TC-07	CB42-3/8	30DW34	C-6-6	T3-EJ
7/16 × 1	SC4	C131	7-16C	SC-4	ETC22				TC-07B	CB42-7/16		SC-4	SC-4
1/2 × 1	SC5	C141	8-16C	SC-5	ETC23	C2GN	X24	C13PW	TC-08	CB42-1/2	40DW36	C-8-8	T3-GL
5/8 × 1	SC6	C161	10-16C	SC-6	ETC24	C2HN	X49	C16PW	TC-09	CB42-5/8	50DW38	C-10-8	T3-IL
3/4 × 1	SC7	C181	12-16C	SC-7	ETC25				TC-09A	CB42-3/4	60DW	SC-7	SC-7
1 × 1	SC9		16-16C	SC-9						CB42-1		SC-9	SC-9
1/8 × 1/2 S.S.	SC11	C5		SC-11	ETC17				TC-06A	SB42-1/8		SC-11	SC-11
1/8 × 1/2	SC12			SC-12			X48			CB42-1/8		SC-12	SC-12
5/32 × 5/8	SC13	C7	5/32C-4	SC-13					TC-06G	CB42-5/32		SC-13	SC-13
3/16 × 5/8	SC14	C23	3/16C-4	SC-14					TC-06B	CB42-3/16		SC-14	SC-14
Ball Burrs													
1/4	SD1	D105		SD-1	ETC9	C3C	X5	D6CW	TC-12	CB48-1/4	20F13W30	B-1-4	102-C
5/16	SD2	D113	5-5B	SD-2	ETC10		X53		TC-13	CB48-5/16		SD-2	SD-2
3/8	SD3	D121		SD-3	ETC11	C3E	X6	D10DW	TC-14	CB48-3/8	30FW34	B-6	T2-E
7/16	SD4	D131	7-7B	SD-4	ETC12				TC-14A	CB48-7/16		SD-4	SD-4
1/2	SD5	D141		SD-5	ETC13	C3G	X7	D13FW	TC-15	CB48-1/2	40FW36	B-8	T2-O
5/8	SD6	D161		SD-6	ETC14	C3H	X8	D16HW	TC-16	CB48-5/8	50FW38	B-10	T2-I
3/4	SD7	D181	12-12B	SD-7	ETC15	C3J	X9	D19JW	TC-17	CB48-3/4	60FW40	SD-7	T2-J
7/8	SD8		14-14B	SD-8						CB48-7/8		SD-8	SD-8
1	SD9	D201	16-16B	SD-9	ETC16		X10	D25NW	TC-18	CB48-1	80FW	SD-9	SD-9
1/8 S.S.	SD11	D103		SD-11					TC-10	SB48-1/8		SD-11	SD-11
1/8	SD12		2-2B-4	SD-12	ETC7		X51			CB48-1/8		SD-12	SD-12
3/16 S.S.	SD13	D22		SD-13					JD-22	SB48-3/16		SD-13	SD-13
3/16	SD14	D24	3-3B-4	SD-14	ETC8		X52		TC-11	CB48-3/16		SD-14	SD-14
Oval Burrs													
1/4 × 3/8	SE1	E105	4-6Q	SE1					TC-21	CB46-1/4		A-1-4	107-C
3/8 × 5/8	SE3	E121	6-10Q	SE3	ETC56		X56		TC-22	CB46-3/8	30GW34	A-6-5	C-50
1/2 × 7/8	SE5	E141	8-14Q	SE5	ETC57	C4GK	X2	E13MW	TC-23A	CB46-1/2	40GW36	A-8-7	C-51
5/8 × 1	SE6	E161	10-16Q	SE6	ETC58	C4HN	X3	E16PW	TC-24	CB46-5/8	50GW38	A-10-8	C-52
3/4 × 1	SE7	E181	12-16Q	SE7	ETC59		X57		TC-25	CB46-3/4	60GW40	SE-7	SE-7
3/16 × 5/16	SE11		3-5Q-4	SE11			X544			CB46-3/16		SE-11	SE-11
Tree Radius-End Burrs													
1/4 × 5/8	SF1	H105	4-10R	SF1	ETC68	C5CH		L61W	TC-26E	CB43-1/4	20P13W30	TR-1-4	104-C
3/8 × 3/4	SF3	H121	6-12R	SF3	ETC69		X12		TC-27A	CB43-3/8	30PIW34	TR-6-6	T4-EJ
1/2 × 1	SF5	H141	8-16R	SF5	ETC70	C5GN	X13	L13PW	TC-28	CB43-1/2	40PW36	TR-8-8	T4-GL
5/8 × 1	SF6	H161	10-16R	SF6	ETC71		X113		TC-28C	CB43-5/8	50PW38	TR-10-8	T4-IL
3/4 × 1	SF7	H182		SF7	ETC72		X15		TC-29B	CB43-3/4	60PW40	SF-7	SF-7
7/8 × 1 1/4	SF8		14-20R	SF8						CB43-7/8	70PW	SF-8	SF-8
1/8 × 1/2 S.S.	SF11	H3		SF11					TC-26A	SB43-1/8		SF-11	SF-11
1/8 × 1/2	SF12		2-8R-4	SF12	ETC67					CB43-1/8		SF-12	SF-12
1/2 × 3/4	SF13		8-12R	SF13						CB43A-1/2	40P2W	TR-8-8	SF-13
3/4 × 1 1/4	SF14	H181	12-18R	SF14	ETC73				TC-29A	CB43B-3/4	60PW	SF-14	SF-14
3/4 × 1 1/2	SF15	H183	12-24R	SF15	ETC74				TC-29D	CB43C-3/4		SF-15	SF-15
1 1/8 × 2	SF16		18-32R	SF16						CB43-1 1/8	90P2W	SF-16	SF-16
7/15 × 1	SF-4			SF-4					TC-27B				
Flame Burrs													
5/16 × 3/4	SH2	G111		SH2	ETC51				TC-52	CB51-5/16		SH-2	SH-2
1/2 × 1 1/4	SH5	G141		SH5	ETC52				TC-53	CB51-1/2	40MW	SH-5	T12-GN
5/8 × 1 7/16	SH6	G161		SH6	ETC53				TC-54	CB51-5/8	50MW	SH-6	T12-IO
3/4 × 1 5/8	SH7	G181		SH7	ETC54				TC-55	CB51 3/4	60MIW	SH-7	T12-JQ

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Comparison Chart for Solid-Carbide Burrs—III

Size	SCTI	Atrax	Dixie	Elgin	Essex	Ford	Fullerton	Grobet	Jarvis	Metal Removal	Pratt & Whitney	Raymac	Rotary
Tree Pointed Burrs													
1/4 × 5/8	SG1	K105	4-10T	SG1	ETC60	C6CH		K61W	TC-62	CB44-1/4	20R13W30	TP-1-4	10-5-C
5/16 × 5/8	SG2	K111	5-10T	SG2					TC-62A	CB33-5/16		SG-2	SG-2
3/8 × 3/4	SG3	K121	6-12T	SG3	ETC61	C6EJ	X35		TC-64	CB44-3/8	30RW34	TP-6-6	T5-EJ
1/2 × 1	SG5	K142	8-16T	SG5	ETC63	C6GN	X37		TC-67	CB44-1/2	40RW36	TP-8-8	T5-GL
5/8 × 1	SG6	K161	10-16T	SG6	ETC64		X46		TC-68	CB44-5/8	50R1W	TP-10-8	SG-6
3/4 × 1	SG7	K182	12-16T	SG7	ETC65				TC-69	CB44-3/4		SG-7	SG-7
1/2 × 3/4	SG13	K141	8-12T	SG13	ETC62		X36	K13KW	TC-65	CB44A-1/2	40RW	SG-13	T5-GJ
3/4 × 1 1/2	SG15	K183	12-24T	SG15	ETC66				TC-69A	CB44B-3/4			SG-15
Taper or 60° Cone Burrs													
1/4	SJ1	M105	4-D-60	SJ1	ETC45				TC-34T	CB50-1/4	20W13W	SJ-1	109-C
3/8	SJ3	M121	6-D-60	SJ3	ETC46				TC-35T	CB50-3/8	30WW	X-6	T8-E
1/2	SJ5	M141	8-D-60	SJ5	ETC47		X72		TC-36T	CB50-1/2	40WW36	X-8	T8-G
5/8	SJ6	M161	10-D-60	SJ6	ETC48		X71		TC-37T	CB50-5/8	50W2W	X-10	T8-I
3/4	SJ7	M181	12-D-60	SJ7	ETC49		X62		TC-38T	CB50-3/4	60WW	SJ-7	SJ-7
7/8	SJ8		14-D-60	SJ8						CB50-7/8	70WW42	SJ-8	SJ-8
1	SJ9	M201	16-D-60	SJ9	ETC50				TC-39T	CB50-1"		SJ-9	SJ-9
Taper or 90° Cone Burrs													
1/4	SK1	R105	4-D-90	SK1	ETC39				TC-34S	CB49-1/4		SK-1	110-C
3/8	SK3	R121	6-D-90	SK3	ETC40				TC-35S	CB49-3/8		Z-6	T9-E
1/2	SK5	R141	8-D-90	SK5	ETC41		X70		TC-36S	CB49-1/2	40WIW	Z-8	T9-G
5/8	SK6	R161	10-D-90	SK6	ETC42		X68		TC-37S	CB49-5/8	50WIW	Z-10	T9-I
3/4	SK7	R181	12-D-90	SK7	ETC43		X63		TC-38S	CB49-3/4	60WIW	SK-7	SK-7
7/8	SK8			SK8						CB49-7/8	70WIW	SK-8	SK-8
1	SK9	R201		SK9	ETC44				TC-39S	CB49-1"		SK-9	SK-9
14° Cone Round-End Burrs													
1/4 × 5/8	SL1	U105	4-10H	SL1	ETC2				TC-74A	CB47-1/4		SL-1	106-C
5/16 × 7/8	SL2	U111		SL2	ETC3	C7RDK			TC-74	CB47-5/16		SL-2	T7-DK
3/8 × 1 1/16	SL3	U121	6-17H	SL3	ETC4	C7REN			TC-75	CB47-3/8	30UW34	SL-3	T7-EL
1/2 × 1 1/8	SL4	U141	8-18H	SL4					TC-77	CB47-1/2	40UW36	SL-4	T7-GM
5/8 × 1 3/16	SL5		10-19H	SL5				Q16RW		CB47-5/8		SL-5	SL-5
5/8 × 1 5/16	SL6	U161	10-21H	SL6					TC-78	CB47A-5/8		SL-6	T7-IN
3/4 × 1 1/2	SL7	U183	12-24H						TC-79	CB47-3/4	60UIW40		T7-JP
Taper or Cone Burrs													
1/4 × 1/2 22°	SM1	L105	48L	SM1			X28		TC-35	CB45-1/4		SM-1	SM-1
1/4 × 3/4 14°	SM2	L104	4-12L	SM2			X29		TC-35A	CB45A-1/4		SM-2	SM-2
1/4 × 1 10°	SM3	L108		SM3			X59		TC-35B	CB45-1/4		SM-3	SM-3
3/8 × 5/8 28°	SM4	L121	6-10L	SM4					TC-36	CB45-3/8		SM-4	SM-4
1/2 × 7/8 28°	SM5	L141	8-14L	SM5			X31		TC-37	CB45-1/2		SM-5	SM-5
5/8 × 1 31°	SM6	L161		SM6			X32		TC-37A	CB45-5/8		SM-6	SM-6
Inverted Cone Burrs													
1/4 × 5/16 10°	SN1	S105	4-5N	SN1					TC-42	CB52-1/4		SN-1	108-C
3/8 × 3/8 13°	SN2		6-6N	SN2						CB52-3/8		SN-2	SN-2
1/2 × 1/2 16°	SN3		8-8N	SN3						CB52-1/2		SN-3	SN-3
1/2 × 1/2 28°	SN4	S141		SN4					TC-43	CB52-1/2		SN-4	SN-4
5/8 × 5/8 19°	SN5		10-10N	SN5						CB52-5/8		SN-5	SN-5
5/8 × 3/4 18°	SN6	S161	10-12N	SN6					TC-44	CB52A-5/8		SN-6	SN-6
3/4 × 5/8 30°	SN7	S181	12-10N	SN7					TC-45	CB52-3/4		SN-7	SN-7
3/4 × 3/4 21°	SN8		12-12N	SN8						CB52-3/4		SN-8	SN-8

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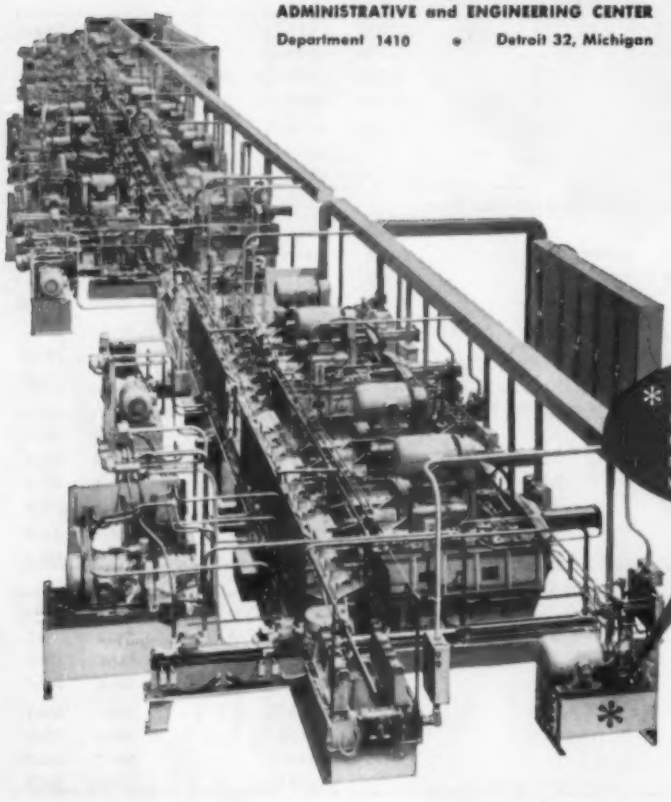
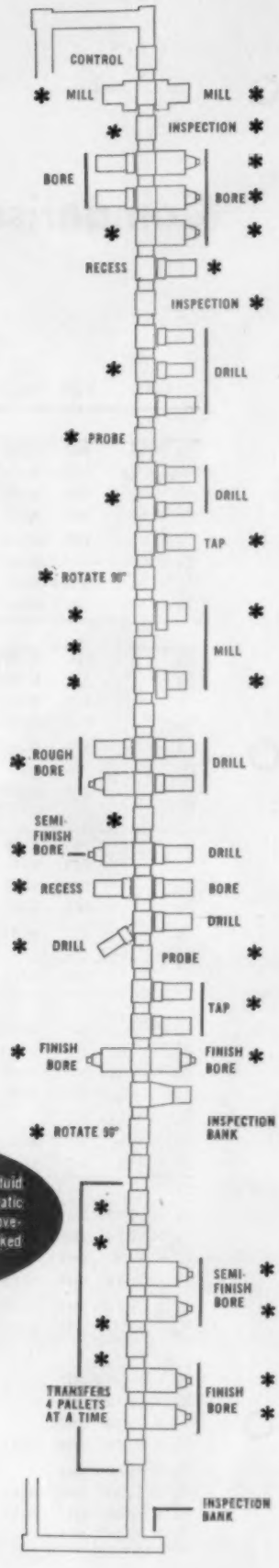


* Vickers power packages supply fluid energy for fast, precise, automatic clamping, transfer and head movement at station locations marked with asterisk.



Handiest Tool in The Shop

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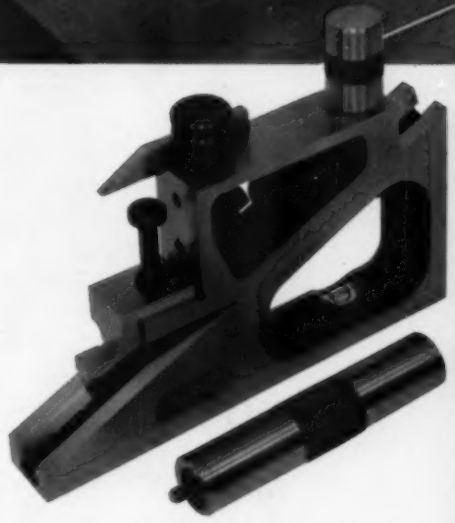
It features a fine adjustment for accurate slide setting; form ground combination flat and "V" ways to eliminate side play; flush surfaces to permit use on base, end, top of slide or sides; and an in-built level. Accessories include: scriber and holder, offset "foot" for reaching into narrow places or below the base line, 1″ extension and 3″ extension.

Craftsmen prefer Starrett tools like these not only for their unfailing accuracy but because they help them work with greater ease and skill. The whole shop benefits when you make Starrett tools your standard throughout the plant. Your nearby Industrial Supply Distributor carries them in stock. Call him for quality products, dependable service . . . or write for Catalog No. 27 showing the complete line. Address Dept. C, The L. S. Starrett Company, Athol, Mass., U. S. A.



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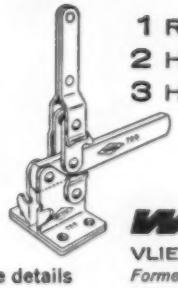

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Talking Shop...

Creative Idleness

SUCCESSFUL ADVANCED study programs must include time for creative idleness, says Dr Walter Hibbard of the General Electric Research Laboratory. This means, he says, occupying the student's hands but not his mind, such as polishing metal specimens. "This situation produces a mental activity where the mind wanders and seeks out subjects of primary interest, analyzes and synthesizes, developes new thoughts and creates new approaches and ideas." This probably explains why we get all our best ideas while taking a shower.

Prime Dip Problems

MANY CAR BODIES are now dipped in a primer. This has created some special assembly problems: Most of the body components must be washed prior to assembly. Solvents in the dip primer would dissolve most sealers and sound deadeners. Therefore, these must be either added after the dip, or made of materials that will resist the solvents and also stand the 375 F bake that follows the dip. At American Motors, for example, ordinary asphalt impregnated roofing paper and neoprene sponge were found the most suitable. It is necessary to have as many openings in the body as possible so the body will fill and drain rapidly. After the body is ready, it gets a hot alkaline wash, followed by phosphatizing, dry, primer dip, drain, and bake.

On the primed body, the sealers and sound deadeners are applied. A wax is sprayed into inside box sections and the holes are plugged with rubber and plastic. The primer, incidentally, is an epoxy-ester type with iron oxide and zinc chromate pigments.

All this trouble because so many cities put salt on the streets and the salt solution leaked into box sections with disastrous results.

Now You Know

IF YOU ARE CONFUSED, as we have sometimes been, by the terms supersonic and hypersonic, here's the distinction: Speeds up to five times the speed of sound are supersonic. Above Mach 5, they are hypersonic.

New Development?

TALKING ABOUT MILLIONTHS isn't quite as novel as we sometimes think. Recently we ran across a letter in our files that was written in 1910. It told of the success that the Gronkvist Drill Chuck Co, Jersey City, was having with a product advertised to be accurate to 10 millionths. (They called it 0.00001 in. in those days.) It turns out that it was made possible by "our Swedish Gaging System." Sounds like gage blocks to us.

Tit for Tat

HERE'S ANOTHER letter from our files, quoted in full:

"During the past two days one of your representatives has been making a personal canvass among the men in our shop trying to induce them to subscribe to the AMERICAN MACHINIST. This has been done during working hours because his chances during the noon hour were so slight that they were almost negligible. This represents an expenditure on our part equal to the number of hours spent by your representative multiplied by the average hourly rating.

"In return for this we would like, if your business policy will permit, to have the names of all those in our shop who are subscribing, or who subscribed to the AMERICAN MACHINIST, because of the inducements offered by this representative. Our reason for asking this is that we believe the progressive ones those who do subscribe to this sort of a paper, and we want to know who the progressive ones are so that when the opportunity for advancement comes they may be the ones who will get the benefit of such opportunity."

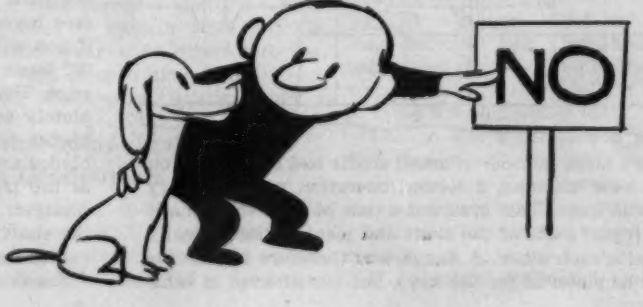
That letter was dated July 7, 1910, and we can't tell you whether the editors of that day granted his request, but the point of view expressed by the man that wrote it makes good sense a half century later.

Common Sense

RIGID RULES are not the way for engineers to achieve a high standard of professional ethics. This point is made rather pungently in the annual report of the Engineers' Council for Professional Development.

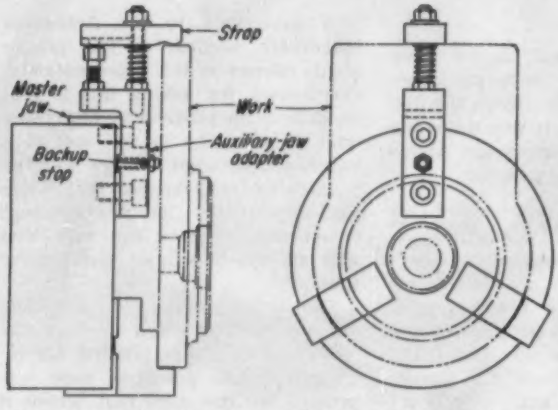
The chairman of the ethics committee reports that he was walking through Richmond Park in London with a British friend. There were many deer, many people, and some dogs roaming freely about. There was also a sign, "Dogs must not chase deer." The friend explained that British people obey this sign by keeping on a leash those dogs that would chase deer, and letting run free those dogs that would not chase deer.

Thus with ethics. We can state the ideal to be achieved, but should leave all the freedom possible for the individual to choose the method of attaining the objective.



Practical Ideas...

Auxiliary Strap Jaw Facilitates Machining Odd-Shaped Parts



Here is a self-contained attachment which can be installed on the master jaw of a three-jaw chuck in place of a regular jaw. It's a handy tool to have around the lathe for those "odd-ball" jobs that come up from time to time.

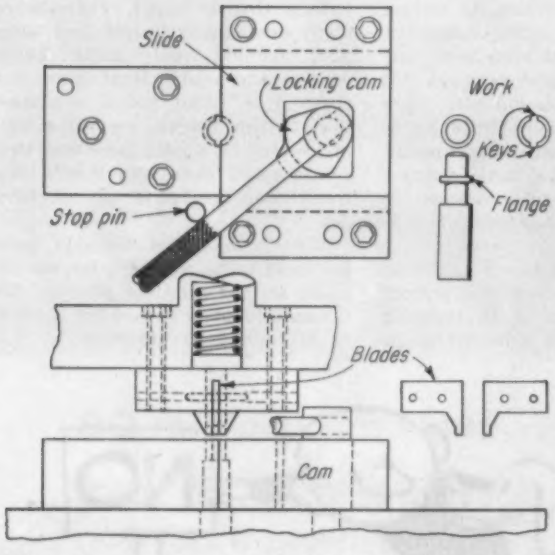
An example of this sort of work is outlined in the illustration. When a three-jaw chuck is used because a fast workholder is desired, it would be impossible to grip a piece like this without an assist from an attachment of some kind. The versatile strap jaw shown is our solution to this and similar situations. The fact that it's adjustable permits fine control for centering the work, and the manner in which the strap is attached offers the advantage of a large clamping range by a mere change of heel screw and clamping stud.

An adapter, made from a block of CR steel, is machined into the shape of an angle. After a key has been milled to fit the master jaw, two holes are drilled and counterbored for socket-head capscrews which secure the adapter to the master jaw. Two holes are tapped in the top side, one to receive the clamping stud, and the other for the heel screw which is turned with a pilot to engage the strap.

The strap itself can either be made or purchased as a standard nut-clamp assembly available from several jig and fixture component manufacturers. In either case, it should have a keyway on its underside for the heel pilot which insures positive engagement and alignment. This is maintained at all times, even when no work is held, by a spring on the clamping stud under the strap. Jam nuts are used to lock the heel and the stud in the adapter. A setscrew and a lock nut may be added to the face of the adapter to serve as an adjustable backup.

D M Hoff, machine shop foreman, Kenosha, Wis

Keys Punched on Small Aluminum Shafts



After a large number of small shafts had been made on the screw machine, a second operation was necessary to finish them. This involved a pair of keys to be made as integral parts of the shaft and located diametrically opposite each other. A flange was therefore left on the shaft as material for the keys, but our attempt at milling away the excess material was abandoned as too slow.

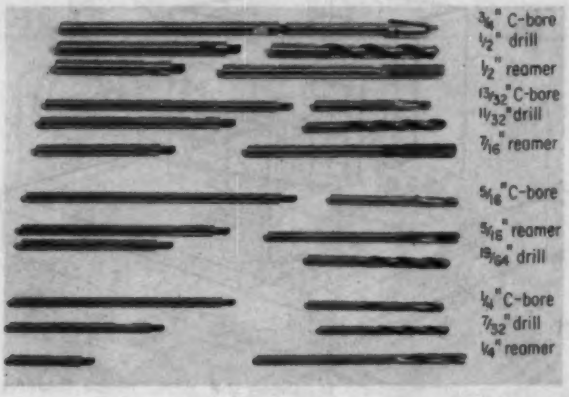
However, a simple, time saving solution was found in the die illustrated. It trims two segments off the flange leaving two keys intact as the finished product is shot through the die into the receptacle. The scrap segments are blown off the die by air.

The bottom half of the tool is made in two sections; one half bolted and doweled to the shoe, the other half a slide operated with a cam. Open, the die accepts the part which is gripped under the flange as the cam lever is swung approximately ¼ revolution clockwise. Since there is no unloading necessary, the actual placing of the part in the die and its closing comprises the entire manual operation.

Made from a square block of tool steel, the punch is designed to enter over the end of the shaft and is therefore bored to accept this diameter. A cutting edge, or if you will, a trimming edge, is produced by turning a 60° taper to blend with the bore thus forming a knife edge. Through the exact center of the bore, and completely across the block, a slot is cut into which two blades are pinned on either side of the bore. These blades are the key punches and are of the same length as the trimming edge. Together with a spring-loaded plunger, these blades exert enough pressure to push the shaft through as the trimming edge shears off the excess material.

Frank A Nelis, Dania, Fla

Threaded Drill Extensions Are Key to Speed and Economy



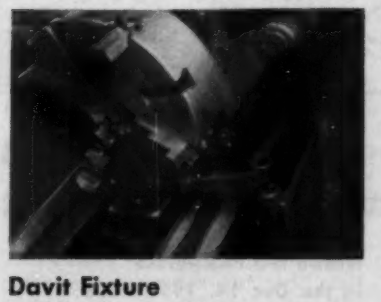
In machining complex parts it is often necessary to provide the machinist with drills, reamers, and counterbores having various shank lengths. Usually, there are three ways in which this can be done: By 1) brazing an extension to the tool, 2) buying tools made to the required length, or 3) using commercial drivers. The first two methods add considerably to the cost of the tool while limiting it to specific applications. As to a slide operated with a cam. Open, the die accepts the for the third, we haven't had much luck with commercial drivers in the past—probably because of our great demands on them.

For greater use of standard drills, reamers, and counterbores, we have turned to the application of threaded extensions. Each machinist is provided with a complete kit of extensions varying in lengths and diameters to cover the full range of tool sizes he will be using on a particular job.

Thus equipped, the machinist may make one tool serve for any shank length required. For instance, if holes to be drilled in a particular part call for shank lengths of 8, 12, and 16 in., assuming all holes to be ½ in., he will use the same ½-in. drill, but will change extensions as needed.

To prepare a standard tool for extensions, the shank is squared off, drilled, and tapped to a size standardized for its diameter. Extension material is drill rod which is threaded and provided with a shoulder to make up against the tool. In both cases, concentricity must be assured before tapping and threading.

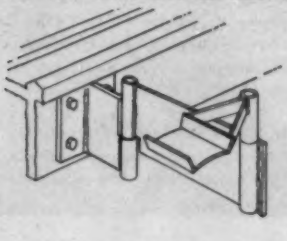
Edward F Schilling, tool methods technician, Ordnance Dept, General Electric Company, Pittsfield, Mass



Davit Fixture Makes Chuck Changing Easy

After several back injuries, resulting from removing or installing heavy lathe chucks, I decided it was time I did something about it.

My solution took on the shape of a davit fixture I refer to as my chuck rest. It is a double hinged arm which is attached to the back frame of the lathe and carries a saddle for the chuck. In use, it swings in over the lathe bed in line with the spindle ready to receive the chuck as it is removed. Nested in the saddle, the chuck can then be swung out of the way behind the head stock where it is stored until needed and where it is out of the way of flying chips.



For my rig, a piece of 6-in. channel iron serves as saddle. It is fitted with a handle for easy operation and with stops which help to keep the chuck in place. Two lengths of flat steel are welded to the side of the channel iron and are joined at the other end with a piece of pipe. A length of pipe welded to each end of a steel plate makes up the intermediate link of the chuck rest. The mounting bracket is a T-shaped weldment also furnished with a length of pipe.

The three sections are fitted together with pieces of shafting which is allowed to remain stationary in one half while slide fittted into the other half of each hinge joint.

Fred Bruckmeier, Austin, Minn

Special Lathe Tool Cuts Graduations

The toolholder shown was made in our shop to simplify engraving graduations on linear scales on work which could be mounted in the lathe.

It's an "overshot" type of toolholder that is secured to the lathe compound in place of the tool post. Fitted with a sharply-pointed toolbit, which can be adjusted vertically for proper depth of cut, the tool is fed across the work by the lathe cross slide. The length of the marks is controlled by the micrometer dial on the cross-feed screw.

With the compound set to travel parallel with the lathe bed, spacings between the graduations are controlled by the compound feed screw while taking readings directly from its micrometer dial.

Though not a production process, this setup will produce accurate work; and it is an economical way of solving a problem frequently occurring in instrument and experimental shops.

H J Gerber, Stillwater, Okla

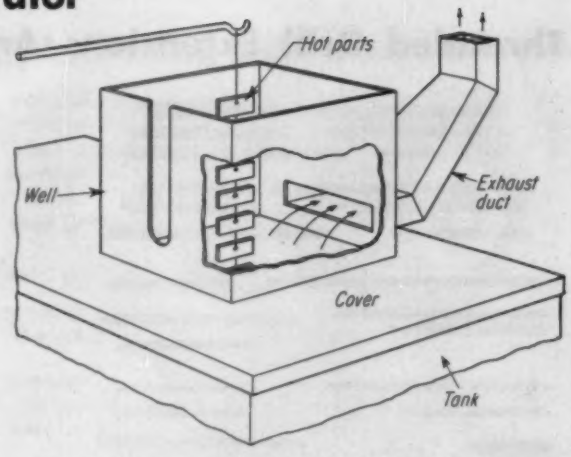
Practical Ideas...

Quenching Well Protects Operator

At the moment parts having been treated in a cyanide bath contact quenching water, a reaction similar to that of a small explosion takes place. This exposes the operator to two dangers: The first is a splatter developed by a mixture of cyanide and water when the two elements meet. The second, and this may prove to be even more dangerous, is the fumes generated through the process. These fumes contain some highly-poisonous HCN gas that will harm the breathing organs of the operator if he allows exposure for prolonged periods.

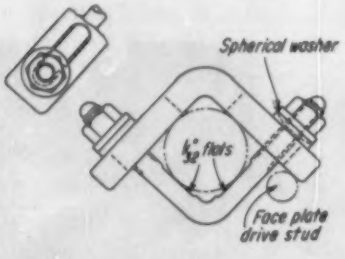
We have eliminated this problem in our shop since covering our quenching tank with the type of quenching well shown in the sketch. It provides protection against splatter and complete evacuation of fumes through an exhaust duct connected to the rear wall of the well.

Made of light steel plate, the well and cover are welded together as a unit which is easily removable for tank cleaning or when larger parts must be quenched. Because most of the parts we heat treat are small they are generally either wired together or placed in a basket or fixture and manipulated with a hook. It is for this reason that the front of the well



has a slot opening to allow the parts to be lowered into the water with the hook held horizontally. The exhaust is tapped into the well as near the top of the cover as possible.

John Obreski, metallurgist, Monarch Machine Tool Co, Sidney, Ohio



Driver Handles Wide Range of Lathe Work

This work driver was designed to overcome some of the faults and limitations of conventional drivers using screws for clamping. It will accept tapered work such as tapershank tools and, because of its construction, one driver can be applied to a wide range of work diameters.

These are but two of the advantages found in this driver that are not present in the standard driver. Another feature, and here is where one of the faults of the screw-clamping driver is eliminated, is that four pressure areas are always evenly divided for a more uniform grip. The conventional driver, on the other hand, has to be tightened quite severely to prevent slippage under heavy loads with the result that the work becomes marred.

A length of drill rod and a piece of flat-ground stock, both bent at 90° angles, make up the main parts of this driver. Both ends of the drill rod are threaded to take standard hex nuts. Under each nut goes a spherical and a cup washer which permit the threaded member to assume the necessary angle when the driver is mounted on a taper. The flat angle, or strap if you prefer, has an elongated hole through each leg with enough clearance to permit the threaded member a certain amount of freedom. All corners are well rounded as a safety precaution, and both parts are hardened and drawn for more durable performance.

F Murray, Chicago, Ill

H Koslow Bronx, NY Won $25 for his idea:

DRILLPRESS VISE NEEDS NO PARALLELS in the Dec 14, 1959 issue

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PAYMENT—in addition to regular rate for item published—will be made as soon as tabulations are completed. The winner or winners—in case of a tie when duplicate prizes will be awarded—will also be announced in these pages.

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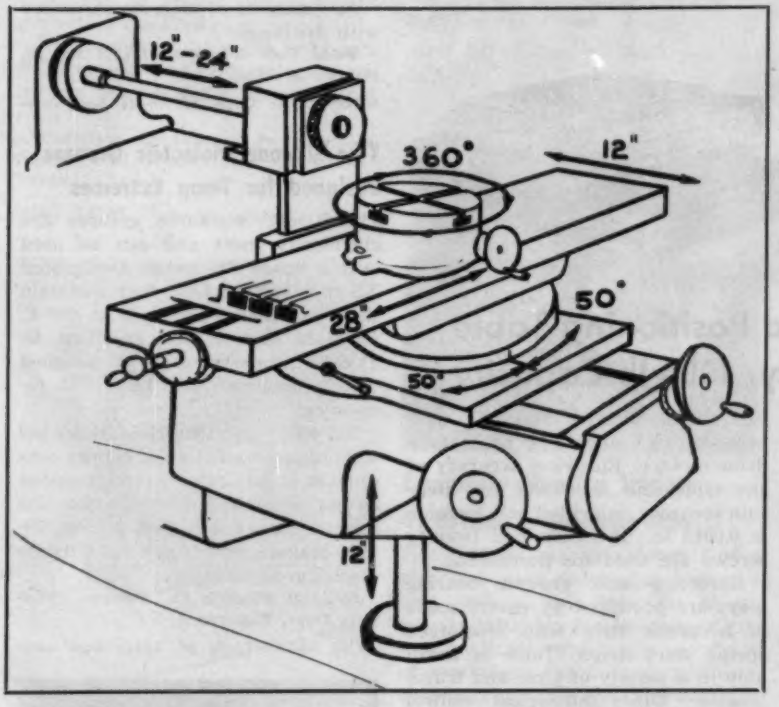
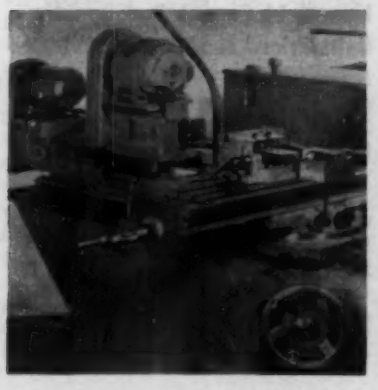
New Shop Equipment
Materials and Parts



Milling Machine Assembly Added to Gun Drill Reduces Short-Run Fixture Costs

This Brown and Sharpe gun drilling machine combines a gun drill unit with a knee-saddle-table assembly of a standard milling machine to provide increased workholding flexibility for short run operations without sacrificing machine rigidity.



A special column was developed to support the knee and the platen which holds the gun drill unit. The column will hold a drill unit for drilling holes up to 12 in. deep and can be modified to hold a unit to drill holes up to 24 in. deep. A 5-hp motor drives the drill at speeds from 2500 to 10,000 rpm.

With the knee-saddle-table assembly used as a positioning fixture, the machine can handle work with a hole pattern covering an area of 12 x 12 x 28 in. The swivel table provides for angular holes up to 50° each side of zero and, with the addition of a rotary table, radial holes over 360° can be drilled.

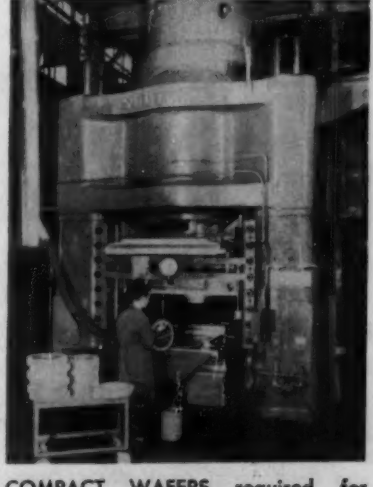
A complete hydraulic system is provided, including a 150-gal coolant tank; ½-hp centrifugal pump which pumps the oil from the chip basket tank through a 150-micron strainer to the baffled tank; 3-hp gear pump which pumps the oil through three more filters of 70, 40 and 5-10 microns; three geared pumps powered by a 10 hp motor to supply clean cool oil to the drill.

The diameter of the hole being drilled governs the coolant pressure and volume to be supplied to the drill. Pumps supply up to 30 gpm at up to 2000 psi to drill holes from ⅛ to 1 in. dia.

In one operation, the machine is used to drill five 5/16-in. holes through the length of a 1-in. sq, 6-in. long 2024 aluminum workpiece. Center distances are held within 0.002 in. end to end; holes are parallel with each other; surface finish is 4 to 8 microinches; total floor-to-floor time is 5 minutes. Setup is reduced to a simple guide bushing and a means of holding the work on the table. The machine can be arranged for optical alignment or adapted to tape control.

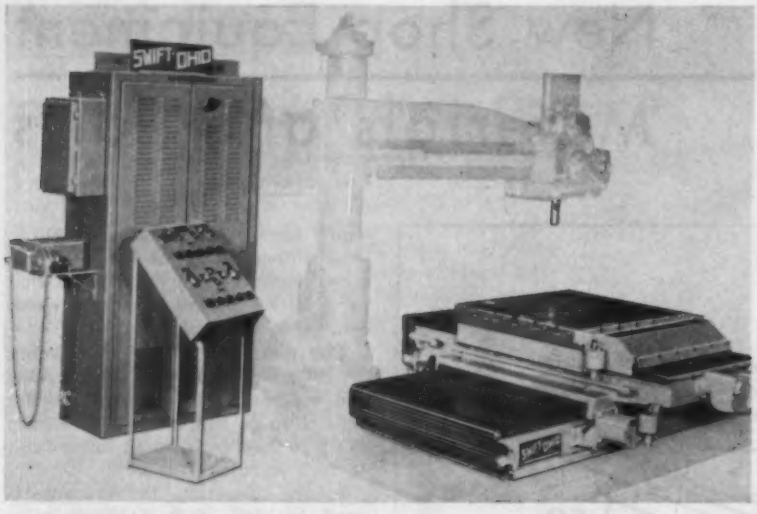
Brown and Sharpe Mfg Co, Providence 1, RI

MORE DATA? Circle 51, inside back cover



COMPACT WAFERS required for large clutch plates are pressed from powder metals by this powder briquetting press, said to be one of the largest in the US. Rated capacity is 8,000,000 lb squeeze—*Wabash Div, Raybestos-Manhattan Corp, Crawfordsville, Ind*

MORE DATA? Circle 52, inside back cover



Numerically Controlled Positioning Table Has 0.0015-in. Accuracy, 4000-lb Capacity

Numerically controlled positioning table, 36 x 36 in., is designed for use with radial drills and horizontal boring and drilling machines.

The entire unit is made of semi-steel castings, well ribbed for maximum rigidity and accurate alignment. Table unit can handle work loads up to 4000 lbs and drilling thrust of 5000 lbs. It has a traverse rate of 150 ipm. Deflection with work load is 0.001 in.

Numerical positioning control unit is General Electric Mark II with precision rack and ¾-hp brake type drive motors. Electrical accuracy of the table unit is 0.00005 in.; absolute accuracy on drilled hole location is 0.0015 in. Precision ball bearing screws are used for positioning.

Hardened and ground bearing ways are protected by covers made of neoprene strip with reinforced spring steel strips. Table is available in a variety of sizes and travel lengths. Other numerical control units can be used.

Swift Ohio Corp, 800 S Leighton, Kenton, Ohio

MORE DATA? Circle 53, inside back cover

Lowcost Automatic Tumbler Offered in Portable Model

Handee slide-Abrader, priced at approximately $200, is designed for shops doing deburring, radiusing, and finishing of small parts. Operator loads the machine, sets the automatic timer, turns on the switch; unit tumbles and finishes the parts unattended. Model weighs 64 lb, has drum diameter of 13 in., drum width of 8 in., operates at 18, 28 rpm.

Chicago Wheel & Mfg Co, 1101 W Monroe St, Chicago 7, Ill

MORE DATA? Circle 54, inside back cover

Rotary Index Table Designed For Assembly, Drilling, Staking

Electronic Roto-Spacer is a rotary indexing table for positioning work on operations such as assembly, drilling, staking and tapping.

Features include: automatic spacing to 0.001 in. of true position, 24 stations, 2-3-4-6-8-12-24 indexes, 12, 15 or 20 in. dia workholding plates, 110-v 60-c gearhead drive, variable-speed control. Workheads cannot operate unless index shot pin is in operating position.

Illustrated is a 15-in. table using air operated drillhead for second operation parts. Microswitch prevents jamming of tools synchronized with drillhead.

M&M Tool Mfg Co, 1124 E 3rd St, Dayton 2, Ohio

MORE DATA? Circle 55, inside back cover

Two Silicone Dielectric Greases Designed for Temp Extremes

These soft, workable greases are chemically inert and can be used over a broad PH range. Designated XS-4006 and SS-4005, they maintain their consistency from -65 to 400 F. Both are said to offer excellent dielectric properties as well as good water repellency and oxidation resistance.

XS-4006, specifically formulated to minimize oxidation of copper conductors, is particularly recommended as an insulating material for use around copper wire and splices. SS-4005 is designed for general purpose electrical applications.

General Electric Co, Silicone Products Dept, Waterford, NY

MORE DATA? Circle 56, inside back cover

Line of 14 Gamma Radiography Units Priced at $1000 to $9900

Inexpensive line of 14 gamma radiography units uses cobalt 60, iridium 192, cesium 137 and thulium 170 to inspect metal castings, parts, and weldments.

Use of standard components is said to result in the lowest prices in the field. Prices range from $1000 for a small hand-carried iridium 192 unit (illustrated) to $9900 for a 1000 curie cobalt 60 unit mounted on a hydraulic truck.

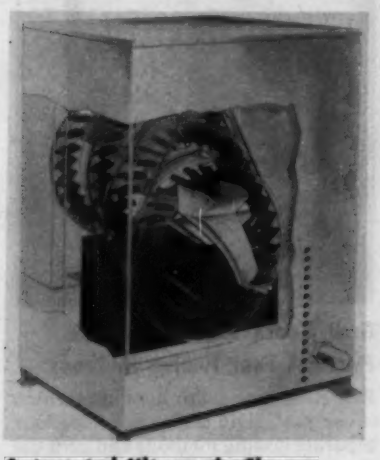
The 14 basic machines are avail-

able with a variety of mounts. All machines can be obtained with more than one source position. Most of the equipment can be used for panoramic exposures where the source is exposed in the center of a group of specimens, radiographing them all simultaneously. Some of the machines can also be used for beam exposures to reduce the auxiliary protection required.

All machines utilize the head as a shipping and storage container, eliminating the need for an additional shield.

Radiation Engineered Services, Lafayette and Water Sts, Norristown, Penna

MORE DATA? Circle 57, inside back cover



Automated Ultrasonic Cleaner Provides Continuous Processing

Automated ultrasonic cleaner, called AutoSonex, integrates cleaning and degreasing with high-speed production of metal parts. It can process machined and sheet metal parts as fast as they come off the automatic fabricators.

Parts enter the cleaner directly from automatic grinders, screw machines, blanking presses and similar devices, as well as from tote boxes via vibratory hopper feed. The machine will keep up with the production rates of virtually all automatics and deliver clean and dry parts.

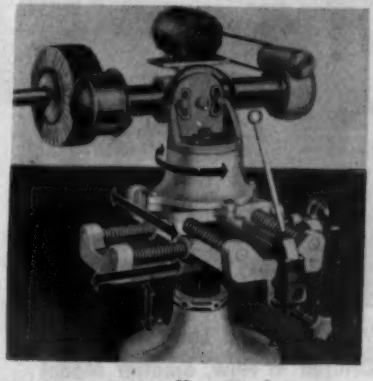
Autosonex features a series of four rotating wheels with evenly spaced boxes to hold the parts. As the parts move through the series of wheels, they are put through an ultrasonic powered degreasing solution, rinsed, drained, dried and discharged.

Purchase, installation, operating and maintenance costs of the machine are said to be less than half of conventional methods. It is available in a variety of sizes and designs and will handle solvents, water solutions or acids.

The standard size takes up a floor space of 28 x 42 in. and is self-contained and movable. It purifies its own solvent by distillation and is sealed to prevent solvent odor from escaping.

Metalclean Equipment Co, Box 177, Bala Cynwyd, Penna

MORE DATA? Circle 58, inside back cover



Equipment Handles Variety Of Buffing or Grinding Jobs

Han-D-Matic machine consists of a standard basic pedestal and spindle unit with a wide selection of optional, interchangeable components which will take practically any shape of workpiece for buffing, grinding, or deburring. It is specially designed for use with the company's standard line of polishing equipment.

Murray-Way Corp, PO Box 180, Birmingham, Mich

MORE DATA? Circle 59, inside back cover

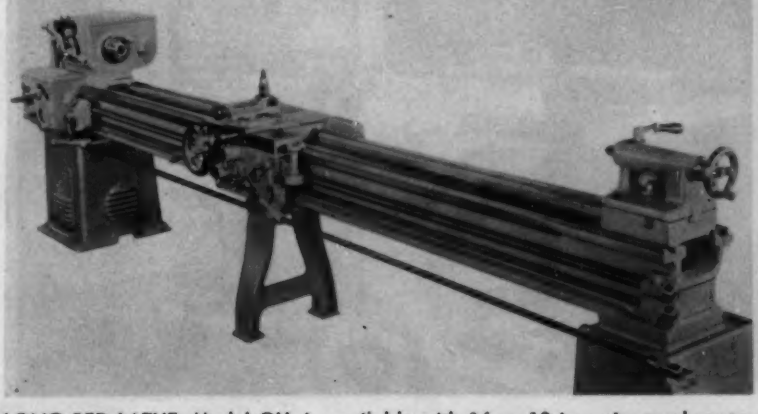
Strippit Fabricator Introduced In New, Improved Version

Model 15A has a new Electro-Hydramatic head which is the part of the machine controlling the power stroke of the ram. This feature eliminates need for pressurized air required on earlier models. A relatively simple electrically controlled solenoid valve replaces the air motor, air motor valve, linkage and piping formerly required.

Model punches round or shaped holes up to 3½ in. in dia in any sheet material (including printed circuit boards) up to ¼-in. mild steel. Maximum notching capacity is 5 x 5 in. in ⅛-in. mild steel and it will do straight line or contour shearing at 165 spm in ⅛-in. mild steel. Change from single stroke punching to 165-spm nibbling is effected by a single toggle switch. Strippit Duplicator is available which converts the machine to a production punching unit.

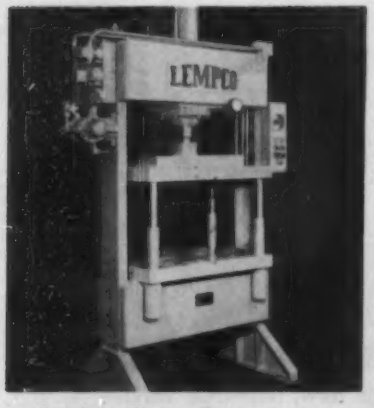
Wales-Strippit Inc, 200 S Buell Rd, Akron, NY

MORE DATA? Circle 60, inside back cover



LONG BED LATHE, Model GH, is available with 16 or 18 in. swing and center distances to 132 in., or 158 in. in special cases. It is powered by a 5-hp motor and has 12 spindle speeds, ranging from 20 to 900 rpm. Gearbox has 48 threads and feeds—*Carroll-Jamieson Machine Tool Co, Batavia, Ohio*

MORE DATA? Circle 61, inside back cover



Hydraulic Platen Press Series Has Ball Bearing Platen Guide

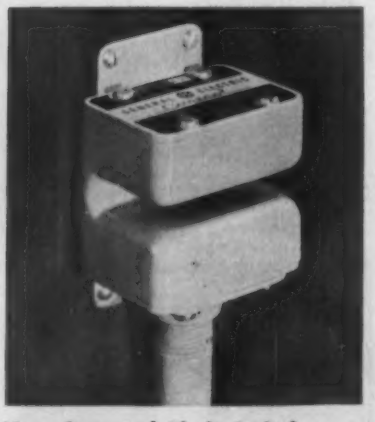
Series 628 and 628A four-column hydraulic platen presses are said to operate almost free of friction because the columns operate in bushings under a 0.0015 in. ball bearing preload. The bearings are positioned in multiple spirals so that no two can track identically.

Series 628 is for plastic molding, series 628A for metalworking. Each series is available in five tonnages, from 25 to 150, and in 20 platen sizes from 18 x 18 in. to 48 x 42 in. Other sizes and tonnages are available on special order.

Presses in the metalworking series operate on a high-low pressure circuit and are powered by pumps developing up to 5000 psi. They feature selective pushbutton operation which includes manual jog and cycle as well as automatic cycling. Automatic cycling includes fast approach, slow press, pressure timeout and fast retraction.

Lempco Industrial, Inc, 5490 Dunham Rd, Bedford, Ohio

MORE DATA? Circle 62, inside back cover



Vane-Operated Limit Switch Offered in New, Smaller Model

Newly designed switch is one-third smaller in size than the previous model and has a wider vane opening. Designed for use in controlling machinery travel, it is available in either front or top operated models, normally open or normally closed, single-pole contacts, with or without an indicating light. A mounting plate with either form can be rotated 90° to permit flexible mounting arrangements. Internal components are encapsulated inside the metal enclosure.

Operation of the precision device is consistent within ±0.0025 in., providing that path of the valve is maintained. Response time is approximately 0.001 sec. Size, top-operated form without indicating light, is 2 11/16 x 2¾ x 2⅝ exclusive of mounting plate.

General Electric Co, Schenectady 5, NY

MORE DATA? Circle 63, inside back cover

Gear Tooth Honing Machine Provides Four Honing Methods

Red Ring gear tooth honing machine of compact, rigid design provides four separate honing methods and uses the same principle as former models.

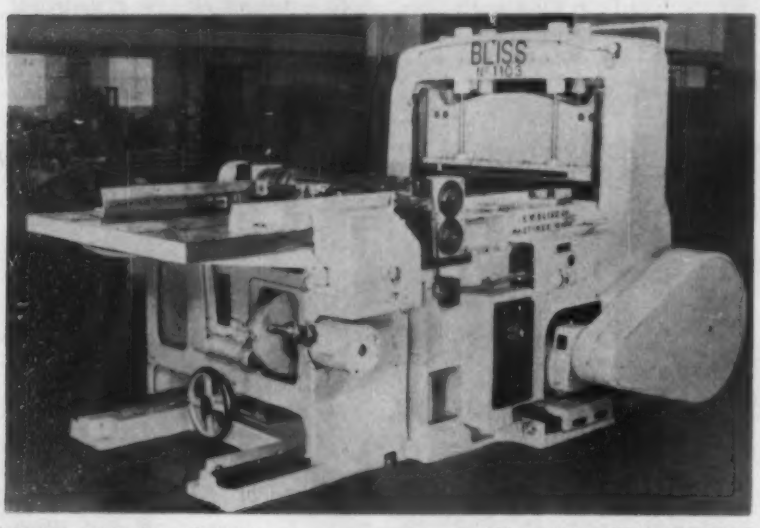
The abrasive-impregnated, gear-shaped honing tool is meshed with the work gear in crossed axes relationship. During the honing cycle, the direction of rotation of the honing tool is reversed while reciprocating motion between the honing tool and work gear is made in a path parallel to the axis of the gear.

Four-way honing includes: honing with backlash with a locked honing head; zero-backlash operation with precision pressure control with the honing lock; constant-pressure operation with automatic mechanical wedge-type backup eliminator; constant pressure operation with overload relief provided by an adjustable leaf spring backup protector.

The machine can handle gears up to 12 in. pitch dia with manual or semi-automatic loading, and up to 4 in. pitch dia with automatic loading. It has a 5 in. stroke and uses a 10 in. dia honing tool. Floor space less panel is 47 x 42 in.

National Broach and Machine Co, 5600 St Jean, Detroit 13, Mich

MORE DATA? Circle 65, inside back cover



SCROLL SHEAR, with 36 in. square capacity, is designed for high-speed automatic production of the scrolled strips used in making can ends, screw caps and similar closures. Every stroke on the No. 1103 is a cutting stroke; there is no idle stroke between sheets—*E W Bliss Co, 1375 Raff Rd, SW, Canton 10, Ohio*

MORE DATA? Circle 64, inside back cover

TOMORROW'S METAL TODAY!

FOR HIGH SPEED FINISH MACHINING ON ALL TYPES OF STEEL!

V-R proudly announces a new tungsten-free cutting tool material, VR-65 . . . the first of a series.

VR-65 meets industry's demand for a material that extends the range of conventional cemented carbides.

VR-65, a high titanium carbide, has high hardness and fine grain structure to provide excellent crater resistance and high resistance to edge wear.

VR-65 has been field tested for over 1½ years. Users report: EXCELLENT. BETTER THAN HOPED FOR.

VR-65 can be brazed to steel shanks and can be ground by conventional methods.

VR-65 stocked for immediate shipment, in precision ground negative rake throw-away inserts. Blanks, tools and other inserts also available.

VR-65 literature is available — write today or see your V-R representative.

CREATING THE METALS THAT SHAPE THE FUTURE

V-R VASCOLOY-RAMET

826 MARKET STREET • WAUKEGAN, ILLINOIS

C-776

CYLINDER-BLOCK TRANSFER MACHINE, designed throughout from standardized components, has 27 stations and 139 spindles. Operations include drilling, coredrilling, counterboring, chamfering and reaming—*Foote-Burt Co, Cleveland 8, Ohio*

MORE DATA? Circle 66, inside back cover

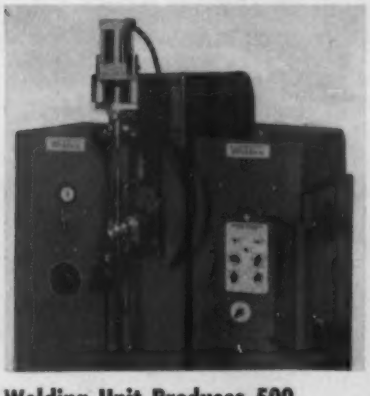
12-lb Air-Powered Nibbler Incorporates Safety Features

Model AN operates on a punch and die action; sheared pieces of metal drop down instead of being hurled upward. It is specially constructed to make it impossible for operator's fingers to come in contact with the punch.

Unit has capacity to cut 3/16-in. copper, brass, aluminum, 10-gage stainless and 8-gage mild steel at a minimum radius of 6 in. Special adapter may be fitted for cutting a 3-in. radius on 12-gage stainless and lighter metals. Tool shears without distorting either side of the material and reportedly leaves a smooth edge which needs no additional finishing. It is available in five styles; each can be used as portable cutting tool or mounted easily to a vise for bench work.

Fenway Machine Co, 3107 N Broad St, Philadelphia 32, Pa

MORE DATA? Circle 67, inside back cover



Welding Unit Produces 500 High-Amp Shots Per Minute

New type of welding unit, called a "spike" welder, is capable of 500 welds per minute. It can be used to weld coated metals without blemishing, to qualification weld ⅛-in. aluminum stock and to weld plated metals, dissimilar metals and delicate parts.

Spike welding is said to combine the advantages of normal spot welding, capacitor discharge welding and percussion welding, while eliminating most of the disadvantages.

With spike welding, capacitors are arranged to give 120 pulses of current per second. These power pulses of over 100,000 amps have a duration of about one millisecond each, which gives a rise time thru the transformer at a frequency of 500 to 600 cycles. The weld transformer can be used to handle much greater peak power than when welding on straight 60 cycles because of the short times. Line demand is correspondingly low. In addition, the greatest amount of heat is generated right at the surface to be welded and cannot spread throughout the work because of the short duration of the pulse.

Metal/Craft Co, 3500 Doris, Detroit, Mich

MORE DATA? Circle 68, inside back cover

Stainless Steel Shim Stock Is Pre-Measured, Calibrated

Each coil of Roblinger PMC stainless steel shim stock is calibrated in ½ and 1-in. increments through its full 60-in. length. After cutting the required size, the pre-measured edge shows number of inches remaining.

Line is available in nine standard sizes from 0.002 through 0.010-in. thickness, made from Type 302 stainless steel rolled full hard spring temper. It is packaged in a self-dispensing box.

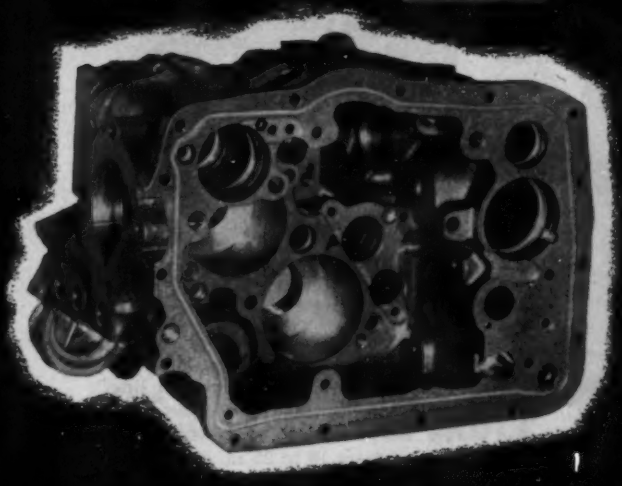
N E Slavin & Co, 40 E Cross St, Somerville, Mass

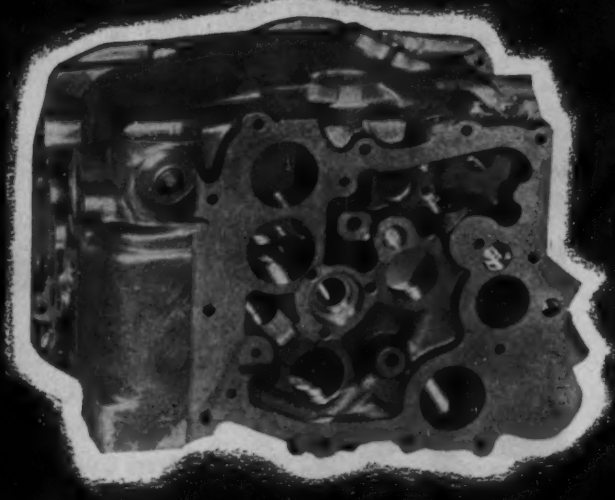
MORE DATA? Circle 69, inside back cover

Silicon Rectifier Welder Designed As Power Source for Stud Welding

Unit has been designed specifically as a power source for Nelson stud welding equipment. Supplied from a 3-phase 60-c 230 or 460-v ac source, the Surge Arc power source pro-

CALL ON **ROTO-FINISH RANSOHOFF** FOR *Finishing Results* LIKE THIS . . .





CONSTANT OVERALL ABRASIVE ACTION—The Vibratron work zone extends throughout the abrasive mass. Every surface is subject to constant vibrating abrasive action.

NO MORE MANUAL HANDLING of parts and media. A built-in removable separator does the job. There's no need for an extra separator.

COMPLEX ALUMINUM CASTINGS DEBURRED 2 at a time . . . in 15 minutes . . . . . the **VIBRATRON** way!

Woodward Governor Co., Rockford, Ill., long a leading manufacturer of all types of governors for prime movers, manufacture such highly precise equipment as jet engine fuel control systems. Precise finish and dimensional tolerances are a must! The fuel control shown above was previously hand deburred and then tumbled in a multiple compartment machine for 1 hour. Now . . . these cases are processed *2 at a time in 15 minutes* in the Vibratron. No hand operation is required and the finish is more uniform.

IF YOU NEED HELP ON A FINISHING PROBLEM, *Write or Phone today* FOR FULL PARTICULARS. IT WILL PAY YOU TO GET THE FACTS ON VIBRATRON PROCESSING.

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CIRCLE 239 READER SERVICE CARD

vides direct current for welding studs through ⅝ in. dia to steel or aluminum. It reaches maximum output in less than one cycle and contains no rotating parts other than a motor-driven ventilating fan.

The welder's 3-phase, full-wave rectifier includes twelve ⅝-in. silicon diodes whose total current carrying capacity exceeds the rating of the welder. Protective devices prevent damage to the diodes if the unit is overloaded by short circuiting or excessive weld times.

Nelson Stud Welding Div of Gregory Industries Inc, Lorain, Ohio, or Westinghouse Electric Corp, Arc Welding Dept, Buffalo, NY

MORE DATA? Circle 70, inside back cover

English Gap Bed Lathe Offers 22-in. Swing, 29-ft Long Beds

Willson (English) gap bed lathe has a 22-in. swing over bed and can be supplied with beds up to 29 ft long. The 18-speed headstock, powered by a 10-hp motor through v-belts has alternate speed ranges of 12 to 580 or 20 to 1000 rpm.

The gearbox provides 40 changes of screw cutting and feed, ranging from 1 to 28 tpi and 0.092 to 0.003 ipr. Other specifications include: 20½-in. wide bed, 11½-in. swing over carriage, 40-in. swing in gap.

Dist by Marton Equipment, Inc, 202 Rantoul St, Beverly, Mass

MORE DATA? Circle 71, inside back cover

Gages Measure Grooves From 0.080 to 0.350 in.

E-Z Dial groove gages' lever action and dial indicator provide a measuring range from 0.2 to 1.6 in. with the small dial reading to the nearest hundredth of an inch and the large dial hand indicating the nearest half-thousandth. Each gage has an approximate range of 0.4 in. in the smaller sizes, larger sizes have range of 0.8 in. Instrument is accurate to fractions of 0.0005 in. Line of four gages has a range of location depths from 15/16 to 2⅜ in.

Maxwell Industries Inc, 493 E 5th St, Ashtabula, Ohio

MORE DATA? Circle 72, inside back cover

Sine-Base Indexing Rotary Table Accurate to 5 Seconds

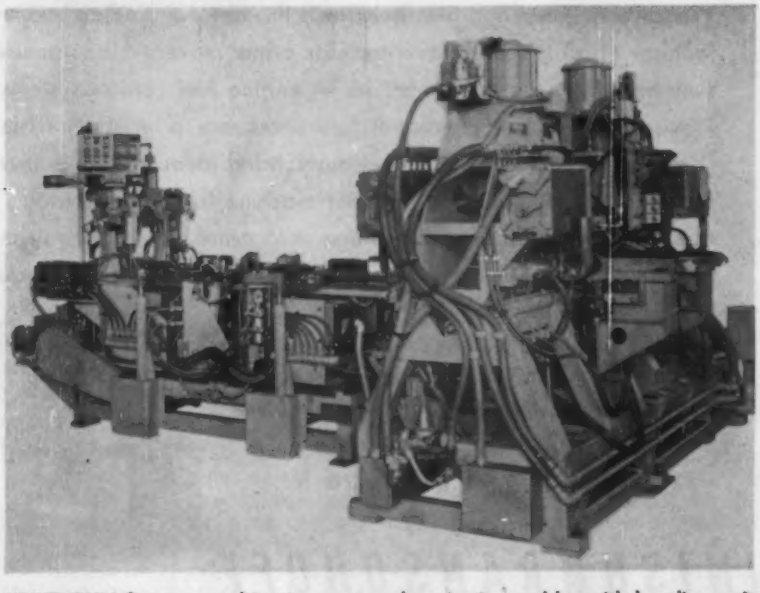
Rotary, tilting-rotary and horizontal-vertical models have been added to the Walter dividing equipment line.

The tilting-rotary tables are available in two models and five sizes ranging from 10 to 25 in. dia. Standard series is accurate to 30 seconds; super accurate series is accurate to 10 seconds. Special models of the super accurate series are accurate to 5 seconds.

Vernier readings of the two series are 6 and 2 seconds, respectively. Tilting angles on all models can be read to one minute. Features include: hardened precision worm gears, immersion of all gears in oil, positive locking devices, correcting mechanisms.

Karl A Neise, 404 Fourth Ave, NY 16, NY

MORE DATA? Circle 73, inside back cover



MULTI-GUN flat top combination spot and projection welder with bending unit forms and welds range oven frames at a rate of 165 assemblies per hour—*Federal Machine and Welder Co, Warren, Ohio*

MORE DATA? Circle 74, inside back cover

New Non-Ferrous Welding Rod Can Join 14 Different Metals

Nickel-Silver gas welding rod, Airco No. 21, can be used to replace many conventional bronze, steel and cast iron welding rods in production and maintenance torch applications where the base metal may be heated to 1750 F.

Formulated for superior flow and bonding properties, it can be used with mild, cold rolled, hot rolled, hot carbon, tool, cast, and stainless steels, cast iron, Inconel, Monel, copper, copper nickels, bronze, and malleable iron. Rods, which can be applied in all positions, are available in 36-in. lengths in 1/16, 3/32, ⅛, 3/16, and ¼-in. diameters packaged in 10-lb boxes.

Air Reduction Sales Co, 150 E 42nd St, New York 17, NY

MORE DATA? Circle 75, inside back cover

46% gain in production with BAKER®

ADJUSTABLE SPINDLE MACHINE

Standard Baker Vertical Adjustable Spindle Drilling Machine.

Cutting production time on an individual part from 6 minutes to 2 minutes, 47 seconds is typical of the production efficiency delivered by a new BAKER drilling machine at a leading manufacturer of power transmission equipment.

The average overall production increase is 46%.

It's flexible, too. Altogether 35 different parts are run across it.

For extra economy, BAKER design permits easy and quick maintenance.

This demonstration of BAKER speed and flexibility proves again that BAKER basic units are the foundation of today's most efficient drilling and tapping operations.

Perhaps *your* "special machine" problem can be solved by a BAKER standard vertical or horizontal unit fitted with the necessary components.

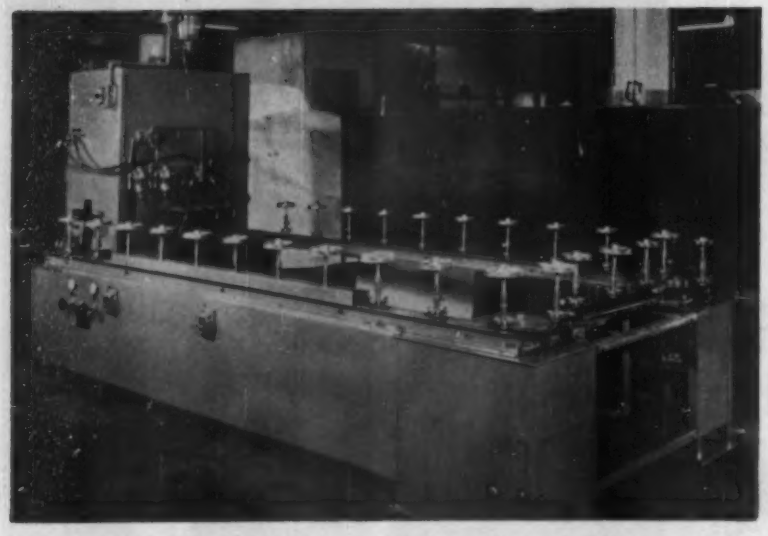
For the full story on these BAKER machines, write to: BAKER BROTHERS, INC., Dept. AH-360, 1000 POST STREET, TOLEDO 10, OHIO.

NOW...COMPLETELY INTERCHANGEABLE

TO FIT 3 SIZES VERTICAL MACHINES	21 ADJUSTABLE SPINDLE HEADS 27 FIXED SPINDLE HEADS 3 TYPES STANDARD TABLES	TO FIT 3 SIZES HORIZONTAL MACHINES

BAKER®

STANDARD AND SPECIAL DRILLING AND TAPPING MACHINES • COMPRESSION MOLDING MACHINES • AUTOMATIC BAR MACHINES



SPECIAL MACHINE which adapts the chain-on-edge principle to automatic spray finishing is equipped to handle necessary spray guns for painting from above and beneath, either or both, continuous or skip spray. Any number of workholders from a minimum of 15 can be supplied on centers to suit size of part, loading and drying time. Unit is equipped with a variable speed drive on the conveyor and can be equipped with variable speed drive to revolve the part—*Conforming Matrix Corp, 321 Toledo Factories Bldg, Toledo 4, Ohio*

MORE DATA? Circle 76, inside back cover

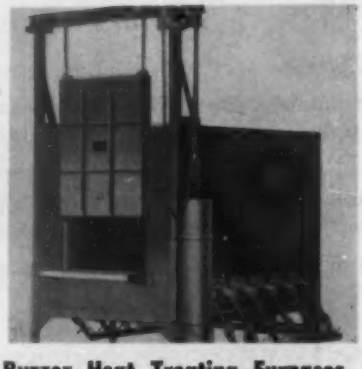
Vibratory Finishing Machine Has 2½ cu-ft Capacity

Model VT-72 Vibrasheen has a standard vibrating frequency of 3380 cycles per minute. Unit activates 100% of the parts and media in the tub in comparison with approximately 20% activation with ordinary barrel finishing equipment. In many instances parts having internal burrs can be completely deburred since the finishing media enters holes and crevices.

Air-actuated cylinder, controlled by a manually operated valve, can pivot the tub (which is lined with ⅜-in. plastisol) through an arc of 130° for easy loading and unloading. Vibratory mechanism is adjustable for an impact range of from 600 to 2500 lb. Model occupies 5½ sq ft of floor space.

Almco, Queen Products Div, King-Seely Corp, Albert Lea, Minn

MORE DATA? Circle 77, inside back cover



Buzzer Heat Treating Furnaces Available in New 30-in. Series

New series of larger floor-type gas-fired ovens includes four models, bringing the standard Buzzer line to 14 units. Larger, special sizes and styles beyond the ranges of the standard line can be built to order.

Model 367236 illustrated is a special size furnace with inside work space measuring 36 in. wide, 72 in. long, 36 in. high. It attains quick heat-ups to 2000 F with an hourly input of 1.5 million Btu, 50% more than the largest cataloged Buzzer unit in the group. Additional features include silicon carbide hearth; six atmospheric venturi burners operating without blowers, power or other auxiliaries; external pilots.

Charles A Hones Inc, Baldwin, LI,

MORE DATA? Circle 78, inside back cover

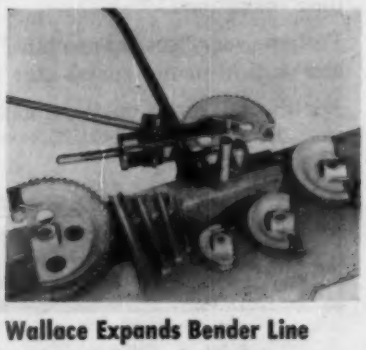
Harper Graphite Tube Furnaces Provide Temperatures to 5000 F

Now built in 17 basic models, these furnaces are available with heated lengths ranging from 12 to 60 in. and tube IDs from 1 to 6 in. They are designed to maintain continuous temperatures up to 5000 F. Basic models include short enclosed entrance chamber, heating chamber, and water-cooled chamber for cooling in controlled atmosphere. Doors are provided at both ends. When application calls for an extremely pure atmosphere, purge chambers can be furnished at both entrance and exit ends.

Work can be pushed through the furnace manually or by means of an automatic mechanical pusher mechanism. Furnace operation can be manual or automatic through on-off control or by stepless control through a saturable core reactor-magnetic amplifier system. Radiation-type temperature detectors can be supplied with potentiometer instruments for indicating, recording, and controlling furnace temperatures.

Harper Electric Furnace Corp, 110 Pearl St, Buffalo 2, NY

MORE DATA? Circle 79, inside back cover



Wallace Expands Bender Line With Hand Bench Model

New T-3 has direct lever operation for bending soft copper and aluminum up to 1½ in. dia and for bending annealed steel tubes up to 1 in.

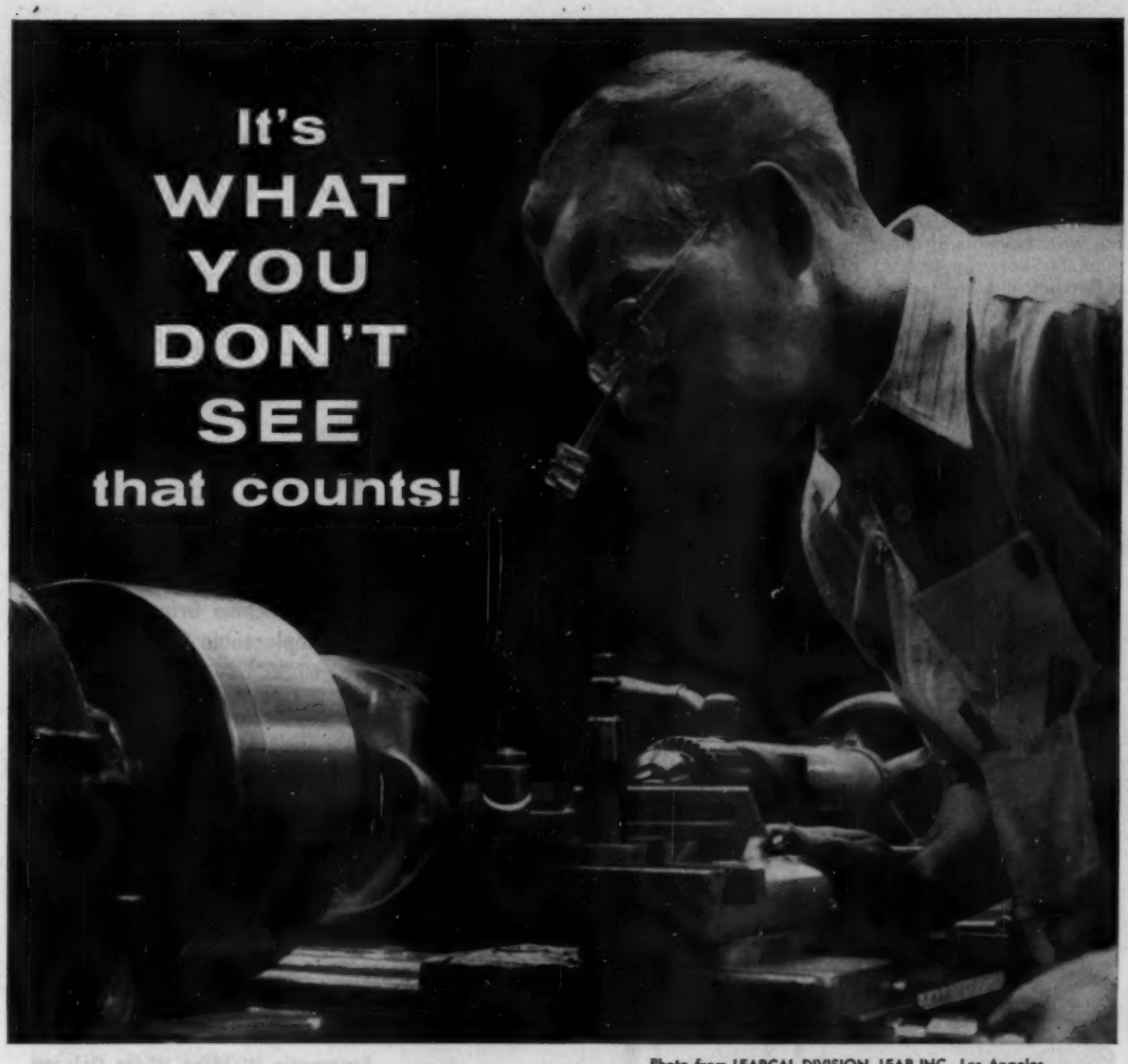


Photo from LEARCAL DIVISION, LEAR INC., Los Angeles

Quality control and production records can quickly prove the efficiency of South Bend 16" Lathes. What you can't see is their *dependability* that assures low cost precision machining for years to come. They can do it because of such features as—

- Integrity of manufacture—honest workmanship using the finest materials.
- Spindle bearings designed specifically for precision work—microfinished sleeve type for close tolerance, *fine finish* work.
- Built to take it for *proven* low maintenance.
- Trouble-free belt drive to the spindle—quiet, no vibration, no gear marks.
- *Write for catalog of South Bend Lathes, milling machines, shapers, drill presses and pedestal grinders.*

Specifications	16" Lathes
Collet capacity	1 1/16"
Spindle speeds	15 to 980 r.p.m.
Cross and longitudinal feeds	48
Threading feeds	48
Base price	$2468

Up to 36 months to pay

SOUTH BEND LATHE

South Bend 22, Indiana

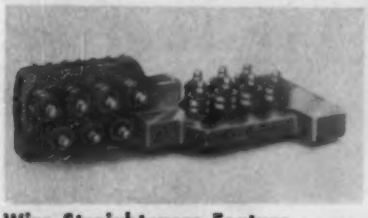
Building Better Tools Since 1906

OD. Model is especially recommended for hydraulic line work and copper water line work. It uses the compression type of bending which gives shorter radii without mandrel use and requires less hand power. It can be used for RH or LH bending with tangents of about one tube diameter between bends.

Ratchet bending action for steel tubes is up to 1½ in. The two ratchet dies, 1¼ and 1½ in. OD, have cast-in ratchet teeth with ratchet lever attachment. Five complete sets of dies cover ½, ¾, 1, 1¼, and 1½ in. OD. Net weight is 117 lb; price is $199.50 fob.

Wallace Supplies Mfg Co, 1304 Diversey Parkway, Chicago 14, Ill

MORE DATA? CIRCLE 80, inside back cover



Wire Straighteners Feature Adjustable Rolls, Needle Bearings

Series of wire straighteners, featuring adjustable rolls and needle bearings, can handle flat or round wire or wire with irregular cross sections. The straighteners consist of two sets of 5, 7, 9, or 11 grooved rolls set at right angles to remove material curvature on both planes.

The rolls can be grooved to the exact diameter of the wire or can be V-grooved for handling a wide range of sizes. Available in five standard and two heavy-duty models, the straighteners can be mounted on slide feeds, roll feeds or hitch feeds.

Durant Tool Co, 1-15 Thurbers Ave, Providence, RI

MORE DATA? Circle 81, inside back cover

Italian 50-inch Gap Lathe Provides 27 Spindle Speeds

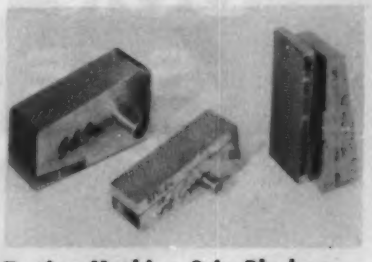
Leonard (Italian) 50-inch gap lathe has 27 spindle speeds ranging from 4 to 825 rpm, with 18 gear-driven and 9 v-belt driven.

Hole through spindle is 5 in. dia and spindles with 6, 9¼ or 13½ in. dia holes can be supplied. Tailstock spindle is 5 in. dia.

The compound rotates through 360° on its swivel. The 42-in. swing model can be equipped with swiveling top slide which provides power angular feeds up to 90°. A motor-drive four-way rapid traverse to carriage and cross slide is mounted in the apron.

Dist by Aaron Machinery Co, 45 Crosby St, NY 12, NY

MORE DATA? Circle 82, inside back cover



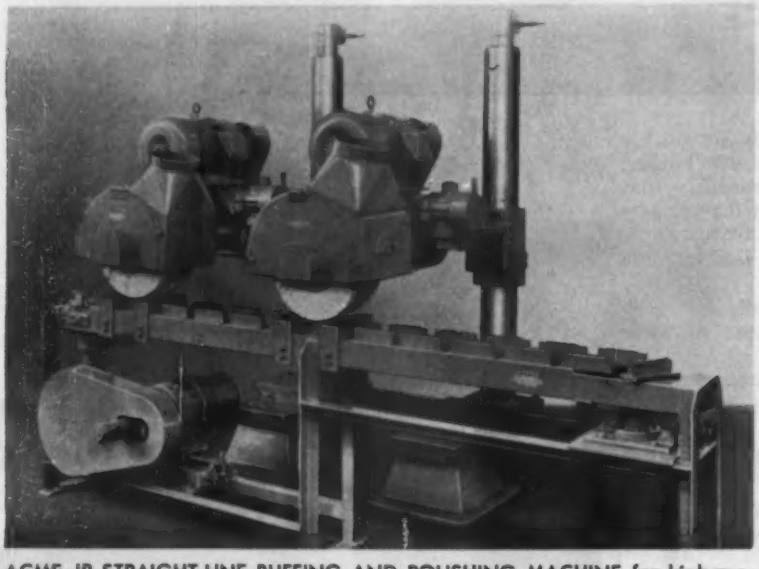
Testing Machine Grip Blocks Have Replaceable Steel Inserts

Grip blocks called Griff Grips are equipped with replaceable inserts and can be used on all standard physical pull testing machines.

The blocks are made of tool steel hard enough to pull without slippage, yet not hard enough to result in frequent breakage. They are available for 8000, 10,000 or 20,000-lb holders. Prices range from $132 per set of four blocks plus $42 per set of four inserts to $175 per set of blocks plus $50 for inserts.

Griff Machine Products Co, 137 Julius St, Pittsburgh 6, Pa.

MORE DATA? Circle 83, inside back cover



ACME JR STRAIGHT-LINE BUFFING AND POLISHING MACHINE for high-production, light-duty operations consists of a 10-in. wide 8-ft long conveyor unit and suitable Acme adjustable lathes which may be positioned around it for tangent or wide-wheel, cross-cut buffing operations from 10 to 30 fpm—*Acme Mfg Co, 1400 E Nine Mile Rd, Detroit 20, Mich*

MORE DATA? Circle 84, inside back cover

Automatic Welding Wires Offered For Submerged Arc Welding

Alloys in this line are made from selected heats of steel with analysis carefully controlled to fuse with the parent metal under automatic welding conditions and give comparable physical and chemical characteristics across the base metal, the affected zone, and the weld metal.

Wires offered are low carbon, general mild steel, high tensile steel, highest tensile steel, mild steel killed, general high tensile, and medium carbon steel. Each coil is carefully thread-wound to facilitate unwinding. Coils are available in weights of 25/30 lb, 55/65, 75/100, 120 or 180 lb, or in fiberboard drums of 250, 500, or 750 lb for uninterrupted production welding.

Air Reduction Sales Co, 150 E 42nd St, New York 17, NY

MORE DATA? Circle 85, inside back cover

DoALL

STAINLESS STEEL GAGE BLOCKS

...better in every way!

Stainless steel gage blocks are another DoALL first —created and perfected after 20 years of research for the ideal gage block material. They have been tested and approved by leading gage block users. Now they're ready for use in your laboratory or shop.

Check these 8 money-saving advantages:

- ✓ **STABILITY**—No growth or shrinkage of over .000002 in. per in. of length.
- ✓ **HARDNESS**—Over 68 Rockwell C any place on block surface.
- ✓ **WEAR**—More than three times the life of ordinary steel gage blocks.
- ✓ **CORROSION RESISTANCE**—Four to five times greater than regular steel blocks.
- ✓ **SURFACE FINISH**—Better than can be measured with a surface analyzer—.09 microinch AA.
- ✓ **WRINGABILITY**—Stainless steel gage blocks wring better than ordinary steel gage blocks.
- ✓ **COEFFICIENT OF EXPANSION**—Stainless steel gage blocks are in the range of most engineering materials.
- ✓ **BRINELLING**—Repeated spindle impacts do not Brinell the DoALL stainless steel blocks.

—plus these important bonus items:

With each set of DoALL stainless steel gage blocks you get these extra values at no charge:

1. a certificate of inspection covering each block in the set;
2. a complete kit for the care of gage blocks;
3. a compact, pocket-size plastic case;
4. educational booklets that explain how to make your set of gage blocks most useful and how to keep them in usable condition.

DoALL stainless steel gage blocks are available in standard sets of 38, 81, 84, 85, 86 and 88 pieces. Blocks are made in all decimal sizes from .050 in. to 4.000 in. and in fractional sizes from ¼ in. to 7/64 in. Accuracies for AA blocks: plus .000002 in., minus .000002 in. Accuracies for A + blocks: plus .000004 in., minus .000002 in.

Call your local DoALL store today. Ask your DoALL Gage Specialist to demonstrate the new stainless steel gage blocks—without obligation.

GB-35

THIS IS A TYPICAL DoALL STORE

The DoALL Company, Des Plaines, Illinois

Gulton Introduces Rotary Tip Ultrasonic Foil Welder

Rotary tip ultrasonic foil welder is said to be designed for continuous welds on flat or semi-circular sheets.

It will weld metals like aluminum foil where surface oxidation or welding heat is usually a problem and metals like copper which have high electrical conductivity. Thickness range is 0.00025 to 0.006 in.

The equipment, measuring 23⅜ x 15¼ x 21¾ in., automatically maintains correct welding angle, speed and pressure.

Gulton Industries, Inc, 212 Durham Ave, Metuchen NJ

MORE DATA? Circle 86, inside back cover

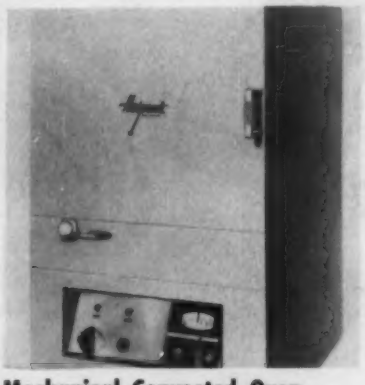
Screw Thread Gage Speeds Inspection

Foster Gage Handle uses principle called suspended motion to provide faster manual gaging of tapped holes with less gage wear.

After starting the gage into the hole in the usual way, the inspector spins the gage the rest of the way in by pulling two tabs in opposite directions. The gage is spun out by pulling a second set of tabs. A torque meter, calibrated in inch-pounds, is available for more precise work.

C E Foster Gage Corp, 5341 English Ave, Indianapolis 19, Ind

MORE DATA? Circle 87, inside back cover



Mechanical Convected Oven Has Range From 35-350 C

Unit is designed for short heat testing, drying, analytical work, and other temperature testing and conditioning processes. Calibrated thermostat dial permits direct setting of desired temperatures and controls setting within 1 C over full temperature range. Selector switch regulates input heater wattage, eliminates heat surges. Automatic overtemperature controller breaks the heater circuit in event chamber temperatures exceed control setting. Recessed control panel is protected by a plexiglass cover.

Electric Hotpack Co, 5035 Cottman St, Philadelphia 5, Penna

MORE DATA? Circle 88, inside back cover

New Line of Custom-Built Motors Introduced by Pope Machinery

Line of motors in NEMA frame sizes is designed for applications where a precision drive is a necessity. They are dynamically balanced to 25 millionths amplitude of vibration. Maximum shaft runout is 50 millionths of an inch.

Motors are available in 1 to 20 hp with speeds from 900 to 3600 rpm and with straight or tapered noses. Unit pictured is being used in a precision grinding application with a Pope balancing wheel holder. Provision has been made in the base for mounting of a wheel guard.

Pope Machinery Corp, 261 River St, Haverhill, Mass

MORE DATA, Circle 89, inside back cover

Cooper Weymouth Improves Line of Scrap Choppers

Self-contained units chop skeleton scrap as it comes from the press into a size easily handled and stored for collection. Design and structural improvements reportedly have made possible a more positive cutting action, eliminating all side motion of the cutting blades. Even thin hardened material may now be chopped without blade spread. Models incorporate helicoil inserts and backup plates on the cutting blades, and heavier, stronger main castings add to more rugged construction. Units are available in three sizes with capacities in mild steel from 6 in. x 0.062 to 12 in. x 0.093.

Cooper Weymouth Inc, 600 Honeyspot Rd, Stratford, Conn

MORE DATA? Circle 90, inside back cover

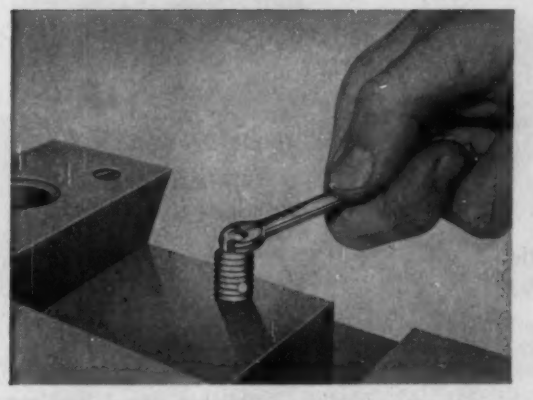
6000-lb Capacity Fork Truck Is Indoor, Outdoor Unit

The Pacer, available with either 10-ft standard lifting mast or optional 7-ft mast, is designed as an all-

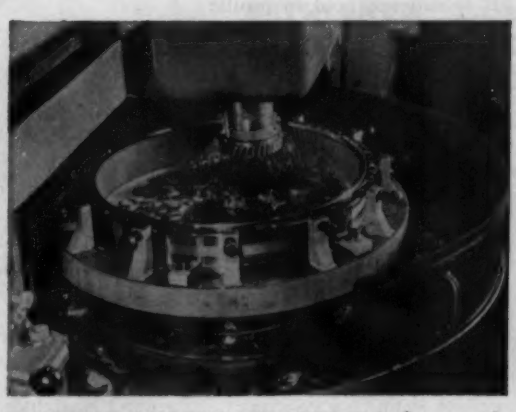
Practical Tooling Tips

No. 4 of a series

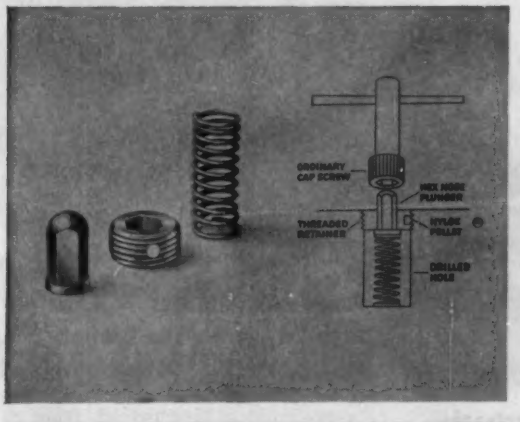
New uses are being found every day for Vlier Tooling Accessories. Perhaps the applications shown below will suggest ways you can profit by replacing costly, custom devices in jigs, dies and fixtures with precision, off-the-shelf Vlier products.



HEX NOSE SPEEDS INSTALLATION OF SPRING PLUNGERS—Vlier Hexnose Spring Plungers are easily installed with a simple end wrench. Eliminates hunting for special wrenches. Made to same exacting tolerances as Vlier Standard Spring Plungers. Available in many end pressures, diameters and lengths.



THIN-WALLED RING GEAR HELD SECURELY in fixture without distortion with 12 Vlier Torque Thumb Screws. Once pre-set end pressure is reached, knurled head spins freely, preventing overtightening. Checknut prevents backing off under vibration. Available in four types; various screw diameters and lengths.



NEW PLUNGER ASSEMBLY PREVENTS DAMAGE TO DIE STOPS—Plunger actuates automatic stop perfectly. Quickly installed, never needs adjustment. Hex nose mates with standard hex head bolts for easy insertion. Nylok® nylon pellet prevents threaded retainer from working loose. 6 sizes from ¼" to 1" diameter. Various end pressures.

FREE IDEA BOOKLET—Illustrations in this 16-page booklet show how others have profited from the use of Vlier Tooling Accessories. Shows both the usual and unusual applications. May suggest ways *you* can save. Write for your copy today.

VLIER
Engineering Corporation
A subsidiary of Barry Controls, Inc.
8900 Santa Monica Blvd. • Los Angeles 46, California

weather outdoor fork truck that can operate under extreme conditions and can also serve as an in-plant vehicle.

Front-wheel-driven truck is equipped with extra-large tires, Roadbuilder 14:00 x 24:00s; short wheel base oscillating rear steering axle for high maneuverability in cramped spaces; power steering and torque converter. Engine is 73 brake hp F-226 Continental; top speed is 30 mph; lift is supercharged hydraulic type.

American Road Equipment Co, 4201 N 36th St, Omaha, Nebr

MORE DATA? Circle 91, inside back cover

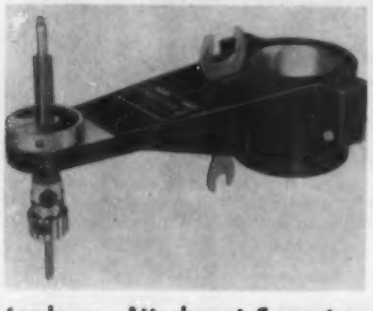
Hydraulic Draw Benders Process Thin Wall Conduit and Tube

Machines, known as Pedrick-Staffa Draw-type Benders, operate with internal mandrels and bend to very close radii.

Features include RH and LH bending with the same tooling; no restriction for minimum size tube; no special foundations for machine which can be moved without stripping; easy access to all subassemblies for maintenance.

Pedrick Tool & Machine Co, 3640 N Lawrence St, Philadelphia 40, Penna

MORE DATA? Circle 92, inside back cover



Leadscrew Attachment Converts Drillpress to Precision Tapper

Auto-Tap attachment which fastens to round column drillpresses can be used with any reversing type head to convert the drillpress into a precision tapping machine. It enables operators with no special skills to precision tap holes on piece after piece without danger of thread damage.

Unit consists of a support arm and support arm clamp, and a precision ground leadscrew and split nut, both of which are interchangeable to permit tapping of a variety of threads.

Ettco Tool & Machine Co, 594 Johnson Ave, Brooklyn 37, NY

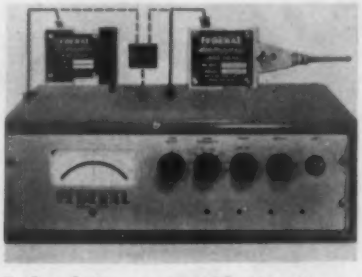
MORE DATA? Circle 93, inside back cover

Stock Straightener Offered In Non-Powered Model

Economy Stock Straightener which can be used with almost any automatic feed has four hardened and ground straightening rolls that take the curvature from coil stock, delivering it smooth and flat to the press. Units are made in three stock width sizes of 6, 12, and 18 in. and have maximum capacities ranging from 6 in. x 0.125 mild steel in the 6-in. size to 18 in. x 0.045 in the largest model.

Cooper Weymouth Inc, 600 Honeyspot Rd, Stratford, Conn

MORE DATA? Circle 94, inside back cover



Federal Announces Electronic Gaging and Classifying Unit

Model 230 M-27 electronic gaging and classifying unit has eight ranges from 0.020 to 0.0001 in., four size control limits and five sorting categories.

It consists of a voltage regulated vacuum tube amplifier, four limit classifier, power supply, meter, number display tube and circuits. Several gage head combinations can be used. Heads can be arranged so that their outputs are either additive or subtractive. Thus, the gage can be used for measuring areas or to weight dimensions with the constants of a mathematical equation. Electro-probe gage heads are furnished with either lever-type or pantograph-mounted contacts.

Federal Products Corp, Providence

MORE DATA? Circle 95, inside back cover

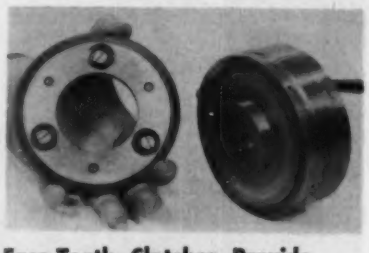
Air Hydraulic Feeds Powered by Shop Air

Self-contained units require no pumps or motors. Almost any sequence of operations can be performed automatically through use of trigger valve actuators or solenoids. Manufacturer reports that no bounce occurs at point of breakthrough or when load is released.

Model 250A has adjustable feed rate control on the specified power stroke and a fast return stroke; Model 250B has individual feed controls on both the in and out strokes.

Superior Controls, PO Box 436, Commercial Rd, Crystal Lake, Ill

MORE DATA? Circle 96, inside back cover



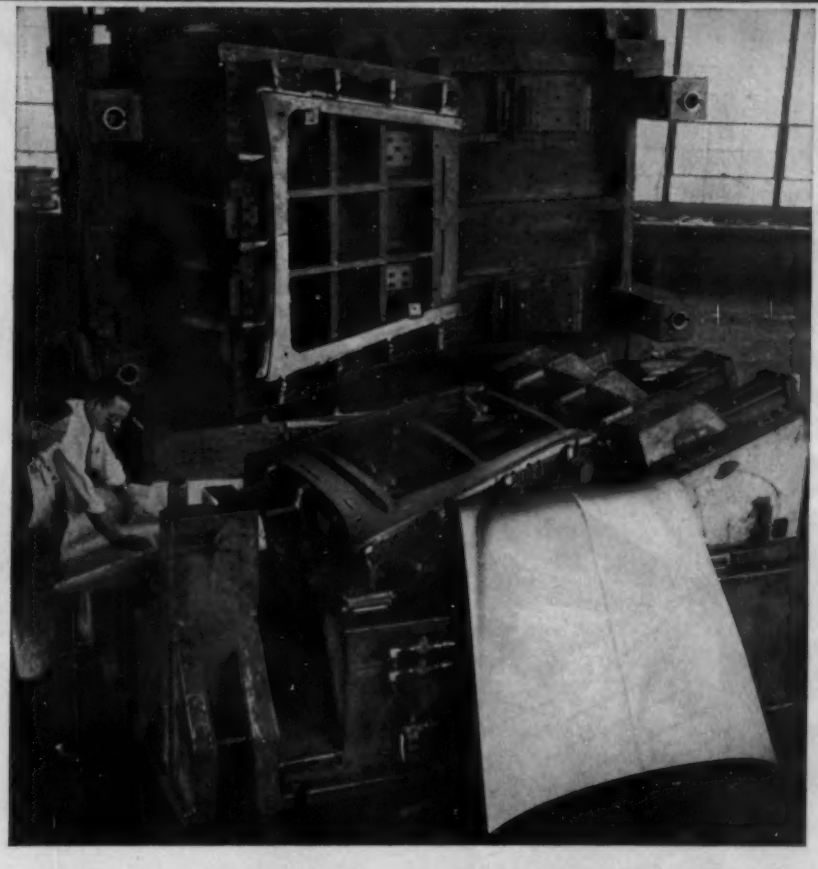
Face-Tooth Clutches Provide High Torque, No-Slip Control

Series added to I-T-E's line of stationary-field electromagnetic clutches is available in five ratings from 30 through 725 lb-ft of torque. Units are reported to provide the highest torque in the smallest space of any commercially available stationary field clutches for such applications as machine tool feed, tracer, and positioning drives.

Features include single-unit construction that simplifies machine assembly, permits fast installation; use of three or six drive pins provides simple attachment to driven member; engagements are made in as little as 0.040 second, disengage-

Tool Steel Topics

BETHLEHEM STEEL



Automotive Die, in 101 Sections, Made from Water-Hardening Steel

This huge die, made up of Bethlehem water-hardening tool steel (SAE W-2), trims an automobile hood. Made from tool steel furnished by Peninsular Steel Co., Detroit, the die was photographed recently at Republic Die & Tool Company, Wayne, Mich. It contains 44 composite sections, 34 wear plates, and 23 solid sections.

Bethlehem water-hardening steels were selected for this exacting application because of their good wear-resistance, easy machinability, and simple heat-treatment—plus ease of welding should repair become necessary.

Bethlehem water-hardening tool steels, because of their carefully controlled hardenability, provide economical service in applications calling for high shock-resistance. And with their highly selective carbon range, they have good resistance to wear, plus the toughness to withstand cold battering.

If you have any questions about the use of Bethlehem water-hardening tool steel, or any of our other popular grades, get in touch with your Bethlehem tool steel distributor. He's as near as your telephone.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Here's How to Stabilize Gages

High-precision gages, commonly made of BTR tool steel (AISI Type 01), need a stabilization treatment if they are to maintain their accuracy for years. Otherwise expansion will eventually change dimensions outside of the permissible tolerance. These dimensional changes are in a magnitude of hundred-thousandths of an inch per inch, or smaller. Insignificant on ordinary tooling, they are important on precision gages.

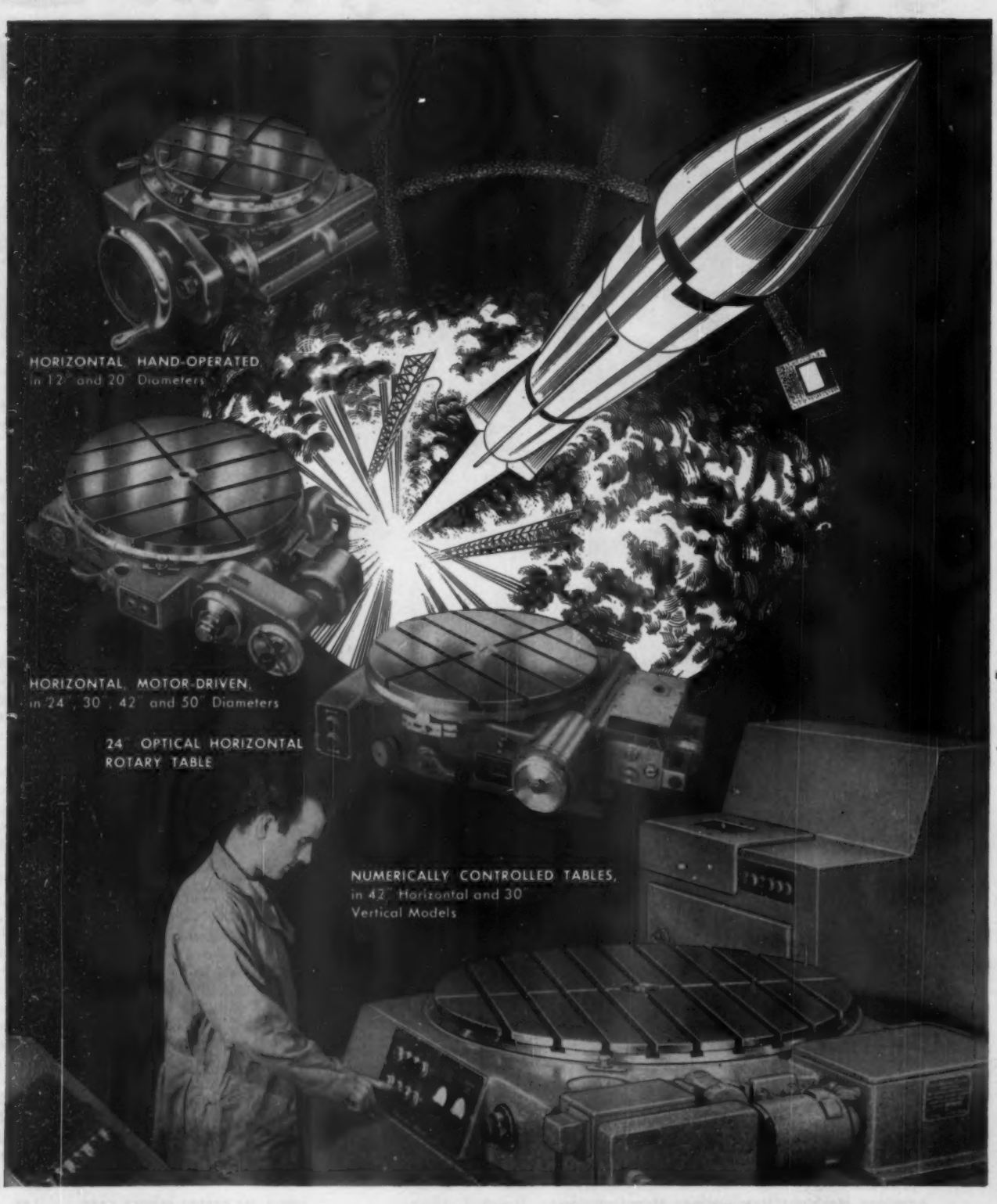
The expansion which occurs over a period of time is due to the transformation of austenite retained during the quench for hardening. The object of the stabilization treatments is to transform the retained austenite during the treatment, so that none remains which could transform later on. This condition exists in all tool steel grades which can be hardened to Rockwell C 60 or higher.

The most common method for stabilizing high-precision BTR gages is: 1. Quench and temper in the normal manner to produce the desired hardness. 2. Rough grind. 3. Subzero cool to minus 100/120 F in refrigerator or dry ice. 4. Warm to room temperature and then retemper at original temperature. 5. Finish grind to size. 6. Repeat cycles of subzero cool followed by tempering five more times. 7. Lap or superfinish to size.

Sometimes it is possible to shorten this procedure, particularly if the design is such that there is little hazard of cracking. For example, the tools can be subzero cooled directly from the quench, with no interval at room temperature, followed by tempering and grinding. This will permit stabilization with only two additional cycles of subzero cool plus temper, but the disadvantage is that cracking may occur after quenching.

It is also possible to shorten the stabilization by cooling to minus 314 F in liquid air. This permits reducing the cycles of subzero cool plus temper to three instead of six.

ACCURACY


HORIZONTAL, HAND-OPERATED
in 12" and 20" Diameters
HORIZONTAL, MOTOR-DRIVEN,
in 24", 30", 42" and 50" Diameters
24" OPTICAL HORIZONTAL
ROTARY TABLE
NUMERICALLY CONTROLLED TABLES,
in 42" Horizontal and 30"
Vertical Models

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PRATT & WHITNEY Precision ROTARY TABLES

In the spacecraft and missile field . . . and in a very wide range of other applications throughout industry, Pratt & Whitney Precision Rotary Tables are first choice wherever the ultimate in dependable accuracy for circular spacing and angular position is a must! Playing an important part in America's space-missile program, P&W Rotary Tables are used for machining, calibrating and testing in the construction of the missiles. They are also used for the extremely critical job of aiming the missiles for firing. Accurate to 2 seconds of arc, the tables used for aiming are equipped with optical attachments and are employed as azimuth indicators.

Providing the right type and size for every requirement, only Pratt & Whitney offers a truly complete line of *precision* tables. As shown on these pages, Horizontal, Vertical, and Tilting types, in Hand-Operated and Motor-Driven models, are supplied in 12" to 50" diameters. Optical, Automatic Indexing, and Numerically Controlled types are also produced. Certified accuracies as high as 2 seconds of arc — from any point to any other point within a full 360° — can be supplied.

If your operations involve circular spacing or angular positioning, the logical tool to reduce costs and insure greater accuracy is a rotary table. And to insure the model *and* the precision you need, it's logical to choose a Pratt & Whitney *Certified Accuracy* Rotary Table. For complete information, call the P&W Branch Office in your area . . . or write direct, outlining your requirements.

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FIRST CHOICE FOR ACCURACY
MACHINE TOOLS • GAGES • CUTTING TOOLS

TILTING, HAND-AND POWER-ROTATED,
in 10", 16", 24" and 36" Diameters

VERTICAL, POWER-ROTATED,
in 30" and 48" Diameters

Because Precision Depends on the Measuring System . . . .

SPECIFY PRATT & WHITNEY JIG BORER END MEASURES AND INSIDE MICROMETERS

Jig borers using the "End Measure" system of locating can only be as accurate as the measuring instruments they use. So, to protect your investment in jig boring precision, *insist* on the best in measurement . . . Pratt & Whitney End Measures and Inside Micrometers. Made from selected gage steels, hardened, seasoned and finished in our standard temperature room, they are your assurance of dependable precision that can help you eliminate scrap losses, increase productive efficiency and up-grade product quality and acceptability.

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Pratt & Whitney Company, Inc.
11 Charter Oak Boulevard, West Hartford, Conn.

. . . THREAD ROLLING DIES • DUOCONE DIES • TAPS • THREAD MILLING CUTTERS • REAMERS . . .

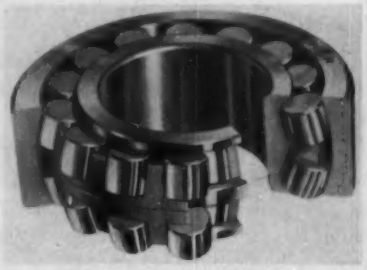
100th Anniversary 1860 PW 1960

PRATT & WHITNEY
FIRST CHOICE FOR ACCURACY
MACHINE TOOLS • GAGES • CUTTING TOOLS

ments in 0.020 second; fine toothing, with no flats on top, provides repetitive clutching in small increments of shaft rotation; minimum backlash; no idle drag.

I-T-E Circuit Breaker Co, 1900 Hamilton St, Philadelphia 30, Penna

MORE DATA? Circle 97, inside back cover



Spherical Roller Bearings Added to Hoover Line

Bearings (made in Japan) are designed with a double row of large-size rollers to take excessively heavy radial and shock loads. High contact angle provides for substantial thrust capacity in either direction.

They utilize a single spherical outer raceway to permit the bearing to compensate automatically for shaft misalignment in any direction, either initially or dynamically under load. Accurate roller guidance is assured by a heavy center guide flange between the two inner raceways, asymmetric roller design and heavy machined bronze land-riding retainers. These bearings are available in a wide range of series and sizes with cylindrical or tapered bore.

Hoover Ball & Bearing Co, 5400 S State Rd, Ann Arbor, Mich

MORE DATA? Circle 98, inside back cover

Double Open Top Blacksmith Forge Welds and Forges Simultaneously

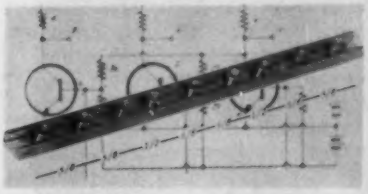
Improved Model 100 for simultaneous forging and welding of bars, rods, and shapes, is fueled with either propane or natural gas. Double top arrangement permits forging fire to be adjacent to welding fire; each top has a swinging arch which allows building of heat chambers with loose brick to handle

a variety of shapes and sizes of work.

Operator can obtain temperatures up to 2300 F and can select and hold any type of flame wanted. Forge is equipped with a 12-oz Mahr 5-hp turbo blower delivering air at 875 cfm. Each side has an air curtain and individual blast gate to allow use of either end of forge alone. Scale and slag accumulations drop into cleanout box under combustion chamber. Dimensions are 112 in. long, 36 in. wide, 30 in. high, floor to top. Top opening is 4½ x 4½ in.; units can be furnished in 4½ x 9 in. or larger sizes.

Mahr Mfg Co, 128 Monk Ave, Hopkins, Mich

MORE DATA? Circle 99, inside back cover



Specially Spaced Gang Channel Speeds Assembly Operations

Kaylock G1928's flexible spacing is designed to save time on assembly lines of engine, airframe, electronics, and missile makers. Specifications of this particular unit called for nut spacings of ⅝, ⅝, and ½ in., in that sequence, which correspond to bolt hole spacings in the electronic equipment which was to be mounted. Rail of the gang channel is aluminum alloy. Carbon steel nuts are the floating, all metal, self-locking type for 550 F applications.

Kaynar Mfg Co, Box 2001 Terminal Annex, Los Angeles 54, Calif

MORE DATA? Circle 100, inside back cover

EPEX MACHINE TOOL

"Congratulations, sir, I've got another mouth for you to feed."

Because Precision Locating is Only Half the Job . . .

CHOOSE PRATT & WHITNEY JIG BORING TOOLS, REAMERS AND STUB GAGES

While accurate positioning is an essential part of precision jig boring, it's only half the job. Equally important is the ability to transfer the inherent accuracy of the machine to the workpiece . . . and to a great degree, this depends on the cutting tools you choose. Help your jig borer deliver its high-precision potential . . . choose Pratt & Whitney Boring Tools, End Mill Reamers and Stub Gages. Designed and produced by people who know jig borers and jig boring, they have *everything* it takes to put precision to work for you more efficiently and economically.

Send now for your copy of Circular 611.
Pratt & Whitney Company, Inc.
11 Charter Oak Boulevard, West Hartford, Conn.

. . . MILLING CUTTERS • CUT-OFF BLADES • END MILLS • KELLER CUTTERS • KELLERFLEX BURS . . .

100th Anniversary 1860 1960

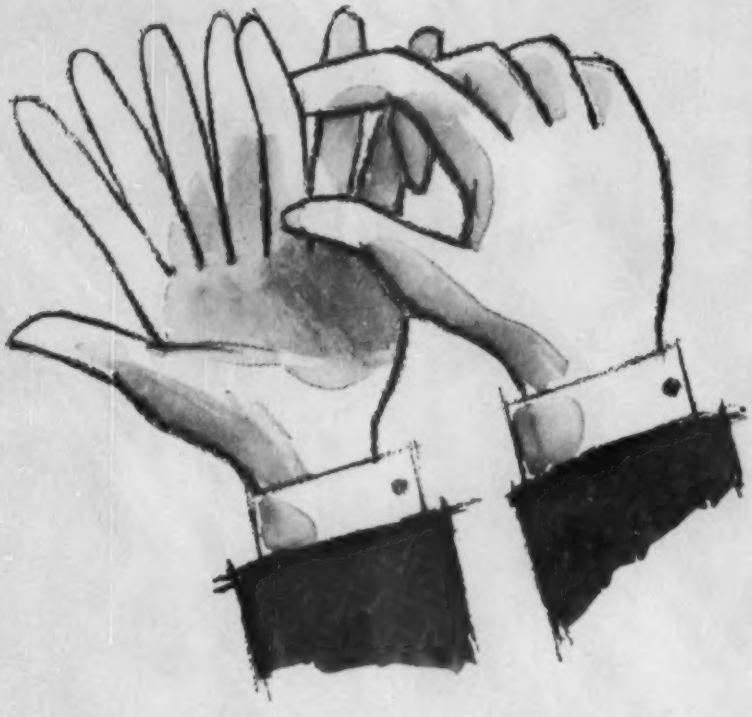
PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

CIRCLE 246 READER SERVICE CARD

Tired of counting the excess?



You save seven ways by using Wheelock-Lovejoy's *local* alloy steel warehouse facilities.

The usual costs of handling, cutting, storage, insurance, taxes, accounting, and—in some cases—obsolescence, are *all* eliminated when you order from your local Wheelock-Lovejoy Service Center. You can order your alloy steel—*as you need it*—in any size, shape or grade. See the listing below for the W-L Branch nearest you.

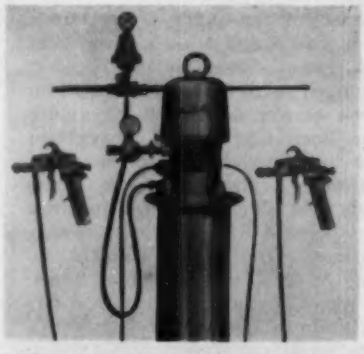
W-L STEEL SERVICE CENTERS—Cambridge
Cleveland • Chicago • Hillside, N. J.
Detroit • Buffalo • Cincinnati

AGENTS—Southern Engineering Company, Charlotte, N. C.; Sanderson-Newbould, Ltd., Montreal and Toronto

WHEELOCK, LOVEJOY & COMPANY, INC.
136 Sidney St., Cambridge 39, Mass.

AMERICAN STEEL WAREHOUSE ASSN.

NEW SHOP EQUIPMENT



Airless Spraying Unit Controls Paint Viscosity at All Outlets

Unit connects to existing circulating paint systems to permit central paint viscosity control of all spray outlets. The Standpipe Hydra-Spray eliminates virtually all overspray and bounce-back at remote spray areas while providing complete, uniform coverage over rough or porous surfaces and maintaining high-speed application.

Paint is kept circulating and only drawn into the unit as it is used. Sealed standpipe allows pumping assembly to operate immersed in solvent. It occupies less than a foot of floor space.

Gray Co, 1037 Sibley St, NE, Minneapolis 13, Minn

MORE DATA? Circle 101, inside back cover

New Barrett Impregnator Speeds Saturation Process

Unit reportedly impregnates in minutes such parts as capacitors, armatures, and other porous and semi-porous objects where hours of soaking or pumping down in vacuum impregnation were previously required.

It utilizes centrifugal impregnation by developing a pressure variance from 100 psi at the periphery to zero at the center of the chamber. Saturants such as varnish, wax, asphalt, oil, or others are pushed into the objects while air and other contaminants are being pushed out.

only McGILL® sealed *CAMROL*® cam followers give you . . .

effective sealing

prelubrication

high radial and shock capacity

in a full range of sizes

Effective sealing of the CAMROL cam follower against moisture, dirt, chips, etc. guarantees longer service life . . . reduces maintenance. This sealed construction retains lubricant and eliminates need for frequent relubrication, so often undesirable in cam action, guide support and track roller applications.

Special seals are built in at stud and flange ends. A black oxide finish on all exposed surfaces offers outside corrosion resistance. The channeled reservoir above the rollers in the outer raceway bore helps store reserve lubricant, sufficient in most cases for lifetime service. Relubrication is possible through convenient oil holes. The new SCF sealed CAMROL cam followers interchange with proven standard CAMROL cam followers. Standard stock with roll diameters up to 4" are available for both stud and shaft mounting.

For maximum bearing life where contamination is a problem, specify sealed CAMROL cam followers. Ask your McGill representative or our engineering department for recommendations.

Write for Catalog No. 52-A

engineered electrical products

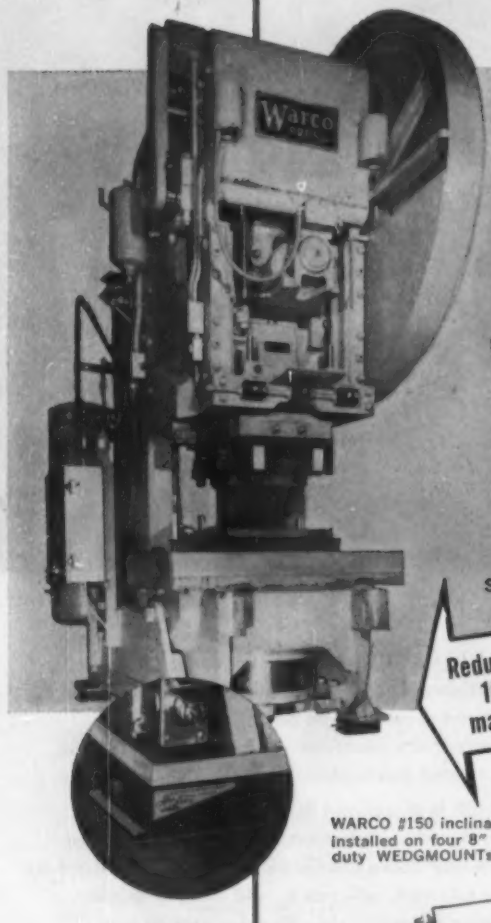
McGILL®

precision needle roller bearings

McGILL MANUFACTURING COMPANY, INC., BEARING DIV., 300 N. LAFAYETTE ST., VALPARAISO, INDIANA

NO MORE ANCHOR BOLTS
TO HOLD YOUR MACHINES

WHEN YOU USE THE Air-Loc® METHOD
4•17•4



You just set the machine on Air-Loc mounts and it operates without vibration and at a greatly reduced noise level. Patented Air-Loc grips the machine to the floor.

New WEDGMOUNT with Air-Loc on top and bottom provides instant precision leveling of your precision machines such as lathes, surface grinders, etc.

Reduce machine sway with 100% contact between machine foot and mount.

WARCO #150 inclinable punch press installed on four 8" x 8" heavy duty WEDGMOUNTs.

Send for the free bulletin which describes this low-cost way to get improved machine performance with less noise.

Clark-Cutler-McDermott Co.
100 W. Central Street • Franklin, Massachusetts

NEW SHOP EQUIPMENT

Manufacturer claims that not only is the part more thoroughly saturated in less time, but excess impregnant on the surface can be spun off, drained out, and saved.

Leon J Barrett Co, PO Box 378, Worcester 1, Mass

MORE DATA? Circle 102, inside back cover

Sunnen Expands Its Line Of Small Hole Honing Tools

Honing mandrels and stones are available from stock for bore diameters from 0.100 through 0.118 in. in increments of 0.002 in. Actual range of each of these mandrels is 0.004 in.; for ultra precise work, however, size of unit to be used should always be within 0.002 in. of the final desired ID. Manufactured for use with Sunnen honing machines, these tools are supplied in both short hole (K series) and long hole (BL series) designs.

Sunnen Products Co, Dept E-3, 7910 Manchester Ave, St Louis 17, Mo

MORE DATA? Circle 103, inside back cover

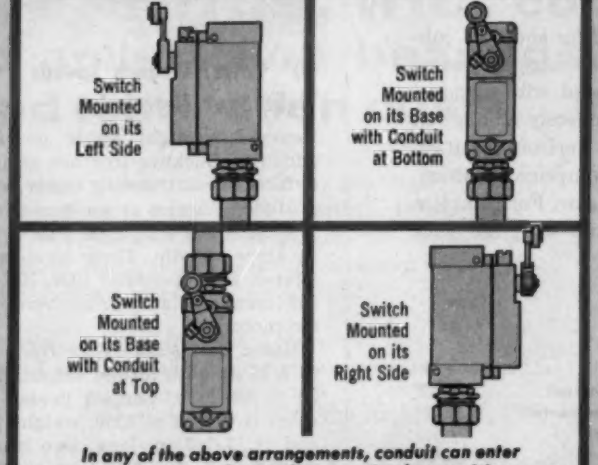
ELF DRILL AND TAP LUBRICATOR, designed to speed drilling of hard metals at various temperatures, applies solid film lubricant directly to drill tips. Worker inserts a running drill tip through the top of container; this lubricates the tip and, upon withdrawal, removes metal chips and any excess lubricant—*Aviation Lubricants Co, 2361 India St, San Diego 1, Calif*

MORE DATA? Circle 104, inside back cover

This New *PLUG-IN* LIMIT SWITCH is SO EASY to Use!

- Oil-tight construction
- Switch plugs in—in seconds
- Mounts without disassembly
- Wired without removing from box
- Reversible plug-in unit—can be plugged-in with roller arm at either end
- Switch action can be reversed by simple screwdriver adjustment
- Present installations easily converted to plug-in
- Precision switch mechanism —only 5° to operate— 25° overtravel in either direction
- Graduated markings around hub of roller arm simplify accurate settings
- Same price as standard Square D oil-tight limit switch

6 MOUNTING ARRANGEMENTS—WITH 1 DEVICE!


Switch Mounted on its Left Side
Switch Mounted on its Base with Conduit at Bottom
Switch Mounted on its Base with Conduit at Top
Switch Mounted on its Right Side

In any of the above arrangements, conduit can enter at either top or bottom by reversing box position

HEAVY-DUTY TYPE T OIL-TIGHT LIMIT SWITCH

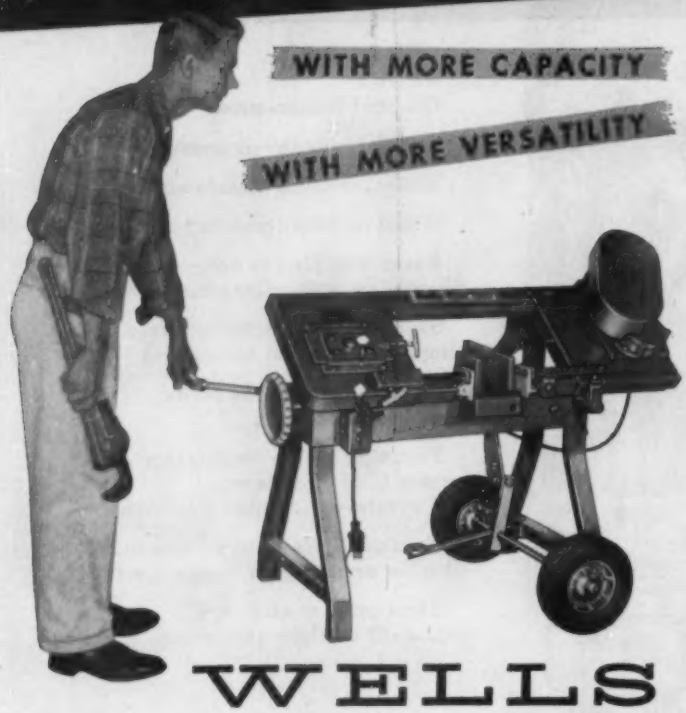
has eleven contact arrangements in one switch. Arms continuously adjustable. Up to 80° overtravel. All switches are interchangeable, easy to mount. Separate packaging of lever arms and switches for simplified stocking.

Write for BULLETIN 9007 AW to Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

SQUARE D COMPANY

wherever electricity is distributed and controlled

A NEW, COMPLETELY MOBILE CONVERTIBLE BAND SAW



WELLS Model 58-B

Here's a compact, convertible band saw designed for shop or "job-site" work . . . the Wells Model 58-B. It provides the capacity you've been looking for . . . at a modest price. Equipped with optional wheel/handle unit, the Model 58-B becomes completely mobile . . . easily rolls from job to job. Use the 58-B as a horizontal cut-off machine (capacity: 6" x 10") or swing the head to upright position, install work table and it's a utility vertical band saw. For complete details on this double duty—double value band saw, see your Wells Distributor or write for Bulletin 262.

SPECIFICATIONS

Capacity:	
Rectangular	6" x 10"
Round	6" Diameter
45° Angle	5" x 5"
Speeds, f.p.m.	76—141—268
Blade Size	½" x .025" x 93"
Motor	½ H.P.
Width of Bed	8½"
Floor to top of Bed	22¼"
Floor Space	19" x 47"
Height (Frame Vertical)	52"
Height (Frame Horizontal)	37"
Vertical Capacity:	
Work Table	7⅝" x 10"
Throat Height	9½"
Throat Depth	7¾"
Net Weight (Approx.)	220 lbs.

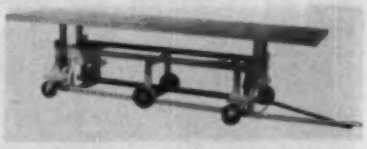
Wellsaw

The Pioneers of Horizontal

Wells

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT ROAD, THREE RIVERS, MICHIGAN



Series of Sheet Feeding Tables Equipped With Elevating Drive

Units, designated Steelmobile Senior, incorporating ball bearing screw operating through a chain and sprocket drive, are designed for sheet feeding operations and similar applications requiring a broad elevating top combined with easy portability.

Capacities range from 4000 to 10,000 lb. Top sizes can be furnished from 24 x 96 in. to 36 x 144 in. Elevating range is nominally 24 in. min height to 40 in. max. Elevation is accomplished through a 2-speed gearbox, crank-driven and self-locking to prevent drift load. Four bolts attach the gearbox to the frame as a unit enabling users to install an electric drive package when made available. Removable tow bar is optional equipment for in-plant movement by lift truck or power-driven transporter.

Jarke Mfg Co, 6333 W Howard St Chicago 48, Ill

MORE DATA? Circle 105, inside back cover

90° Power Wrench Speeds Tight Spot Nutrunning

Heavy-duty right angle wrenches added to Buckeye line are designed to facilitate nutrunning under power in difficult access areas. Non-reversible units are stall type with 1/2-in. sq drive spindle. Three models are offered with speeds of 1000, 700, and 500 rpm available from vane-type air motors.

Rated bolt sizes range from 7/16 to 9/16 in. with torque outputs from 30 to 63 ft-lb. Largest model (500 rpm) is priced at $350, weighs 9 lb, and is 17-7/8 in. long; two smaller models sell for $305, weigh 8-1/4 lb, measure 16 in. long. All have head diameters of 1-3/4 in. and height of 2 in. For max operating efficiency, 90 to 100 psi working air pressure through 3/8-in. ID hose is recommended.

Buckeye Tools Corp, 5003 Springboro Pike, Dayton 1, Ohio

MORE DATA? Circle 106, inside back cover

Bearings, Inc. converts plain bearings to anti-friction bearings... cuts maintenance and lubrication costs... increases production!

Many of our customers have realized considerable savings by converting to anti-friction bearings. Our bearing engineers recommend the best bearings for each type of application, design and supervise production of the special housings often required.

The result is a clean, economical conversion that is quickly installed and materially reduces maintenance and lubricating costs. Production, with better quality, is usually increased.

Ask a BEARINGS, INC. engineer to survey your production machinery. He may be able to suggest and recommend bearings that will increase production at lower cost. Change-overs from plain bearings to anti-friction bearings are a specialty with us.

Call the BEARINGS, INC. branch nearest you NOW!

Providing bearing service in the North ➤ **BEARINGS, INC.**

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Painesville • Toledo • Youngstown Zanesville • **INDIANA:** Ft. Wayne • Indianapolis • Muncie • Terre Haute • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York **WEST VIRGINIA:** Charleston • Huntington • Parkersburg • Wheeling • **NEW JERSEY:** Camden **NEW YORK:** Bolenrol Corp., Buffalo • Niagara Falls • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

and

in the South ➤ **DIXIE BEARINGS, INC.**

FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans **N. CAROLINA:** Charlotte • Greensboro • **S. CAROLINA:** Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville • Nashville **VIRGINIA:** Norfolk • Richmond

MSO GRINDERS - PACEMAKERS for better grinding methods —

The ultimate in precision grinding to close tolerances with micro inch finish — for Toolroom — for Production

MSO builds
- Universal Grinders
- Production Grinders with automatic plunge or traverse grinding cycles
- Thread Grinders

When only the best will do — check MSO first

Model FMES Universal Grinder with compound swival wheelhead capacity 7" x 12"

austin industrial corporation

76-F Mamaroneck Avenue — White Plains, New York

MSO JIG BORING MACHINE
WITH LEITZ OPTICS
Table size — 33½" x 18½"
Spindle speeds — 63 — 2000 RPM
Boring depth — 12"
Net Weight — 7500 lbs.
MSO The ULTIMATE in
precision
Setting accuracy .00002". Positioning accuracy .00012"
speed
Select any point as starting point. "Zero-in" scales by push button. Read scales to millionths without leaving operator's position.
ease
Direct reading on magnified screens in any quadrant from zero point. Table moves on double roller guides.
When only the best will do — check MSO first.
austin industrial corporation

76-F Mamaroneck Avenue — White Plains, New York

NEW SHOP EQUIPMENT

New Toolbits Fill Gap Between HSS and Carbide

DoAlloy toolbits are made of a cast alloy cutting tool material that fills the gap between the maximum speed possible with HSS and the minimum speed practical with carbides. Generally they can be run at cutting speeds 50% to 100% higher than HSS. They are recommended for general purpose work on both ferrous and non-ferrous materials and are reported to be particularly advantageous at high speeds and heavy loads where considerable heat is generated.

These toolbits have a high red-heat hardness substantially beyond temperatures at which HSS tools break down. They do not have as high a red-heat hardness as carbide but have greater shock resistance. Products are available in squares 1/4 in. through 3/4 in., also in two styles of cutoff blades.

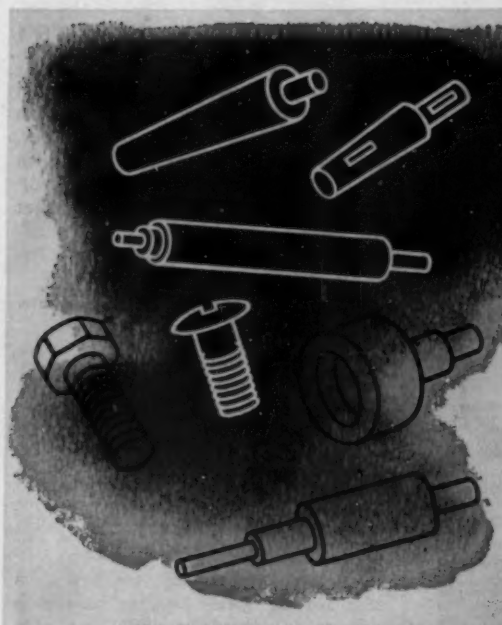
DoAll Co, Des Plaines, Ill

MORE DATA? Circle 107, inside back cover

6-gpm Variable Vane Pump Added to Vickers Line

While specifically designed for low-cost machine tool drill feed and automation applications, the new pump is said to be particularly useful as a fluid power source for varying volume demand circuits. It automatically limits its delivery to system demand at preselected adjustable pressures.

Unit includes an integral pressure compensator that can be set for 200 to 500-psi operation. Maximum delivery can be limited by means of



Machine it! Put it to work!

Prehardened

VISCOUNT 44

High Strength Steel

No Further Heat Treatment Necessary!

Here's the high strength steel that cuts engineering and maintenance problems to the bone on maintenance and machine tool applications. Unexcelled strength, good toughness and increased wear resistance—these are the advantages of VISCOUNT 44, even when exposed to temperatures up to 1000°F.

More important, risk of size change and distortion of critically-engineered parts during heat treatment is completely eliminated. VISCOUNT 44 is furnished prehardened at Rockwell C 42-46 . . . it's practical to machine . . . easy to work!

Have a high strength steel problem? Call a Latrobe sales engineer today! Or, send for VISCOUNT 44 literature.

NOMINAL ANALYSIS

Carbon	.40	Chromium	5.00
Silicon	1.00	Molybdenum	1.20
Manganese	.75	Vanadium	1.00

plus Alloy Sulphides

MECHANICAL PROPERTIES

Furnished Hardness	RC 42-46
Tensile Strength	180,000-220,000 psi
Yield Strength (0.2% offset)	160,000-200,000 psi
Reduction of Area	40-50%
Elongation, 2"	10-15%
Coefficient of Expansion 80-1000°F	7.0 x 10^{-6} inches/inch°F

TYPICAL APPLICATIONS

Spindles • Shafts • Brake Dies • Forming Rolls • Tie Rods
Arbors • Axles • Bolts • Structurals • Cams

LATROBE Metalmasters

LATROBE STEEL COMPANY
LATROBE, PENNSYLVANIA

BRANCH OFFICES and WAREHOUSES:
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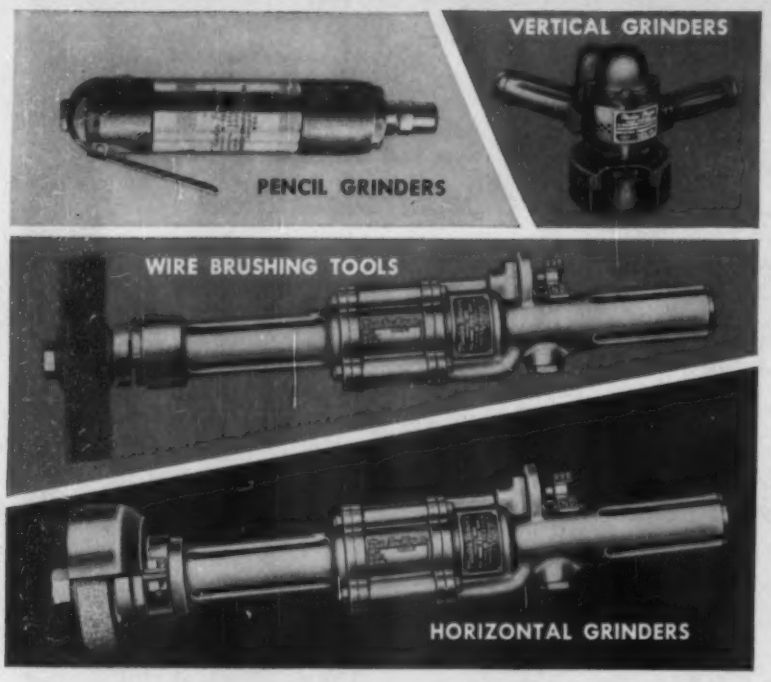
10-DAY TOOL TEST



Discover how customized MASTER POWER AIR TOOLS are custom-sold, custom-installed and custom-serviced

Master Power Grinders are fitted individually to your job, precision-built and can frequently be serviced on the spot. Master Power Grinders are easy to handle. For example, the low slung handles on the vertical grinder offset gyroscopic swing. Important wearing parts are hard chromed for longer life. Mail coupon today for 10-day tool test.

Master Power
CORPORATION • Bedford, Ohio
A Black & Decker subsidiary

Look under TOOLS-PNEUMATIC HOISTS-PNEUMATIC

Master Power Corporation, Dept. 201, Bedford, Ohio

Gentlemen: I want to run a Master Power 10-Day Tool Test. I understand there is no obligation.

☐ I am interested in *Impact Wrenches*
☐ I am interested in *Threaded Fastening Tools*
☐ I am interested in *Percussion Tools*
☐ I am interested in *Abrasive Tools*
☐ I am interested in *Air Hoists*

Company.....

Individual.....

Street.....City.....Zone.....State.....

In Canada: MASTER PNEUMATIC TOOLS (CANADA) LTD., REXDALE-TORONTO, ONTARIO

a mechanical adjustment. For most circuits, little more is needed than tank, pump, and actuating member. Model is designed for operation with 1800-rpm electric motors. It is available for flange, foot, or gasket mounting.

Vickers Inc, 1402 Oakman Blvd, Detroit 32, Mich

MORE DATA? Circle 108, inside back cover

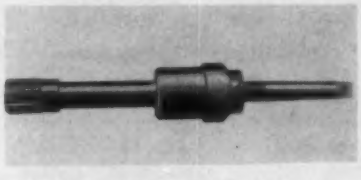
Self-Adjusting Live Center Has Simple Six-Part Design

One-piece main body, serving as a cup for the roller bearing on which the spindle turns, permits use of a much greater than normal capacity bearing in a standard size body. Automatic wear adjustment takes place as the tapered roller bearing moves back when wear occurs. The ball bearing is thus pushed back, retaining concentricity, eliminating eccentricity and bearing failure due to neglect of a manual take-up adjustment.

Center has a concentricity of less than 0.0001 in. TIR. Both the conical and cylindrical bores of the body are ground at the same setting in the workhead. Point is ground under load in its own bearings to insure running dead true. Heavy spindle with wide spaced bearing design minimizes deflection. Guaranteed by the manufacturer for 2000 hr or one year, units are available in several standard sizes and capacities.

J & S Tool Co, 87 Dorsa Ave, Livingston, NJ

MORE DATA? Circle 109, inside back cover



Roller-Burnishing Tool Finishes Bored Holes

Adjustable tool will finish bored holes in any machineable metal to 4-15 mu-in. surface smoothness in seconds, eliminating honing and grinding operations. It can be mounted on a drillpress, lathe, or screw machine; even an unskilled operator can set the tool quickly and

LeTourneau-Westinghouse gives heavy-equipment customers swift, direct-from-factory service via AIR EXPRESS.

Air Express gets road scraper back to work fast!

This giant dirt-moving scraper stands idle. A replacement contactor switch was needed. The local distributor found the item temporarily out of stock. But one phone call and AIR EXPRESS, the nation's most complete air-ground shipping service, sped a replacement direct from manufacturer to construction site. Once again, dependable, convenient AIR EXPRESS saves a modern business time and trouble. Small wonder that so many of today's sales-minded concerns use this low-cost service even for day-to-day shipments. Why don't you let AIR EXPRESS —jet-age wings of modern marketing—get your firm's products FIRST TO MARKET . . . FIRST TO SELL!

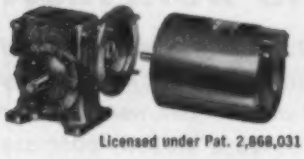
AIR EXPRESS

CALL AIR EXPRESS DIVISION OF RAILWAY EXPRESS AGENCY • GETS THERE FIRST VIA U. S. SCHEDULED AIRLINES

PERFECTION
Flanged & Motorized Worm Gear SPEED REDUCERS

Perfection Motorized Worm Gear Speed Reducers are available in 956 different combinations, with ratios ranging from 5 to 1 to 60 to 1, and in capacities from 1/6 H.P. to 5 H.P. This line of complete Motorized Reducers is available from stock for immediate delivery. Perfection "C" flange Reducers may be ordered complete with motor or without motor, to be used with a motor of your own choice.

Flanged motor reducers offer the maximum in compactness, rigidity and adaptability. Through the use of standard NEMA face mounted motors, complete interchangeability between motors is provided. Motor maintenance is possible without disturbing the drive and reducer. Motor assembly is fast and positive with no alignment problems.



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Write for your free copy of our new 28 page catalog containing illustrations, charts and tables to help you choose the right Reducer for your particular application. Ask for Bulletin No. M-140.

AMERICAN STOCK GEAR DIVISION
PERFECTION GEAR COMPANY **HARVEY, ILLINOIS**

turn out up to several hundred finished pieces per hour.

This self-feeding tool is recommended for all metals not over 35R_c. Units are available in every 1/64-in. increment in sizes from 0.375 to 0.484 in. and in every 1/32-in. in-increment in sizes from 0.500 to 7.437 in. Adjustment range is—0.003 to +0.017 in. of specified tool size up to 0.484 in. On larger tools (0.500 to 7.437 in.) adjustment range is —0.004 to +0.037 in. of specified tool size. Tools are available for through hole and blind end burnishing and for various bore depths.

Gustav Wiedeke Co, 1833 Richard St, Dayton 1, Ohio

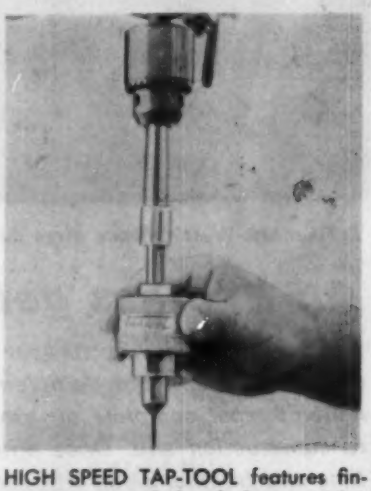
MORE DATA? Circle 110, inside back cover

Chicago-Latrobe Offers New Aircraft Drill

Drill, made of 8% cobalt super HSS, is designed with short, sturdy flute and a special split point for production drilling of high strength alloys. It is available in wire gage, letter and fractional sizes, with jobbers lengths.

Chicago-Latrobe, 411 W Ontario St, Chicago 10, Ill

MORE DATA? Circle 111, inside back cover

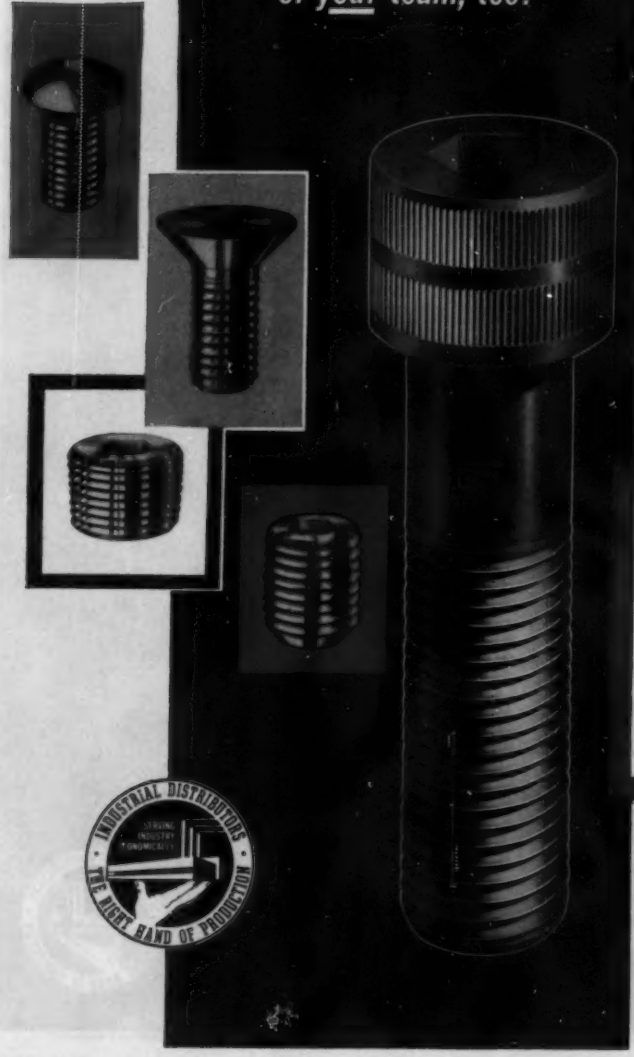


HIGH SPEED TAP-TOOL features finger tip control head for precision tapping 0-80 to 4-40 holes in steel. Head is adaptable for through or bottom tapped holes. Powered by standard drillpress, 0-80 holes can be tapped at rate of 10 per minute—*Armite Laboratories, 6609 Broad St, Los Angeles 1, Calif*

MORE DATA? Circle 112, inside back cover

INDUSTRIAL DISTRIBUTORS ARE PART OF THE H-K TEAM

. . . and important members of your team, too!



- Since the company was founded in 1929, Holo-Krome Forged Socket Screw Products have been sold only through authorized, stock-carrying industrial distributors. We believe this method of distribution is both economically sound and efficient. Distributors carry an adequate stock of H-K products right to the door of your plant; they provide on-the-spot engineering assistance; their knowledge of local problems means you get the products you want, when you want them, in the quantity you need.

- H-K's distributor team is as important as any department of our company. To back up our distributors, we are continuing to improve our product quality as well as our packaging, labeling, shipping, telegraph quoting service—and our unmatched SAME-DAY SERVICE on standard items.

- Know your Holo-Krome industrial distributor; call on him for assistance; rely on him for prompt service and technical help...

HE'S A RESPECTED MEMBER OF THE H-K TEAM!

HOLO-KROME SOCKET SCREWS

THE HOLO-KROME SCREW CORPORATION • HARTFORD 10, CONN.

Sold only through Authorized Industrial Distributors

• ALBRECHT
The world's most accurate keyless drill chuck
distributed in the United States and Canada by
Jacobs
and your Jacobs Chuck distributor
INDUSTRIAL DISTRIBUTION
THE RIGHT HAND OF PRODUCTION
JACOBS MANUFACTURING COMPANY • WEST HARTFORD, CONNECTICUT

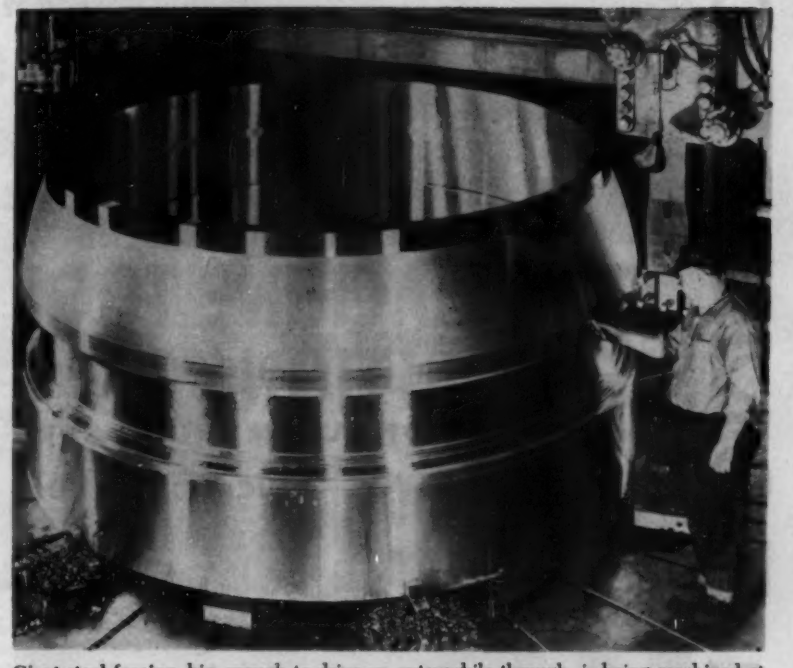
FIELD REPORT...

Ex-Cell-O Buys Optical Gaging

Ex-Cell-O Corp of Detroit has acquired all of the capital stock of Optical Gaging Products Inc, Rochester, NY, and will operate it as a wholly owned subsidiary. Company makes standard and custom chart-gages and staging fixtures for optical projectors; it also makes and distributes layout machines and materials.

Motch & Merryweather's . . .

. . . Allied Products Division has been appointed to handle sales for Taft-Peirce Manufacturing Co of Woonsocket, RI. M&M, operating from its Pittsburgh and Cleveland offices, will sell products of the T-P Small Tool & Gage Divisions throughout eastern Ohio, western Pennsylvania, and the state of West Virginia. Taft-Peirce is a leading manufacturer of setup, production, and quality control equipment for the metalworking industry.



Giant steel forging, big enough to drive an automobile through, is being machined at US Steel's Homestead District Works. The 27-ton ring stands almost 6 ft high and measures 10 ft across on the inside. In spite of its size it must be finished with jewel-like precision for it'll be the inner spherical seat of the main bearing on which the world's largest radio telescope will revolve. When fabrication and construction of the $79 million instrument are completed Navy scientists will be able to "see" and "hear" objects in space up to 38 billion light years away

Half Billion in New Equipment Needed by US Foundries

Nation's foundries will need over $509 million in new capital equipment during the next two years according to a national survey just completed by the American Foundrymen's Society. In addition to these capital needs, the foundries expect to spend nearly $6.8 billion for materials, supplies, and special services in producing an estimated 37.6 million tons of finished castings in 1960 and 1961. The foundry industry as a whole anticipates an average increase of 15% in output this year and 20% in 1961.

More efficient materials handling equipment tops the list of most-needed items followed by better molding and core-making equipment, and new equipment for cleaning and finishing of castings. Other needs; better or new equipment for sand conditioning; shell molding, annealing and heat treating, melting; machine tools, and casting machinery.

Shipbuilding Orders Still Nil

January was the eighth consecutive month in which the American shipbuilding industry received no new orders, according to the Shipbuilders Council of America. Backlog of ship construction that's keeping the major yards in operation totaled 59 as of the first of last month. On Feb 1, 1959, seventy-four ships were on order; on Feb 1, 1958, there were ninety-four, and on Feb 1, 1957, ninety-nine.

Thirty of the fifty-nine vessels under construction or on order are scheduled to be delivered this year; twenty-two are to be completed in 1961, and seven are to be launched in 1962.

Ajax Electric to Handle Barkling Gas-Fired Furnaces

Ajax Electric Co, Philadelphia, will handle sales and service throughout the US of furnaces produced for over 38 years by Barkling Fuel Engineering Co, Chicago. Barkling distribu-

McGIRK'S WORKS

by GEO. CRENSHAW

SLURP!
SLURP!
SLURP!
DID I HEAR YOU DRINKING SODA POP AT THE SWITCHBOARD AGAIN ?!!
WHY, MR. McGIRK— HOW COULD YOU THINK SUCH A THING?
MOE'S CORNER
She fooled him that time...but that McGirk usually sees EVERYTHING you do! I swear, he's got eyes in the back of his head!
I DO NOT!

FORMULA FOR TOMORROW

THE MACHINE TOOL EXPOSITION - 1960

INTERNATIONAL AMPHITHEATRE

CHICAGO, ILLINOIS

SEPTEMBER 6-16

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION

MMTBA

Field Report . . .

tion has been confined largely to a few midwestern states. Ajax will now offer, in addition to its own salt bath furnaces, a complete line of Ajax Barkling gas-fired heat treating and melting furnaces. Barkling units will continue to be produced at the Chicago plant.

Chrysler Delaware Plant Gets New Tank Order

Chrysler's Lenape Ordnance Plant at Newark, Del, is getting a contract for manufacture of 180 more M-60 tanks. Department of Defense has approved $27 million for the order. Defense, according to reports, was planning to by-pass the Chrysler plant and call for bids for 720 M-60's under next year's budget from plants in the Detroit area.

Moline Buys Mobilift's Truck Line

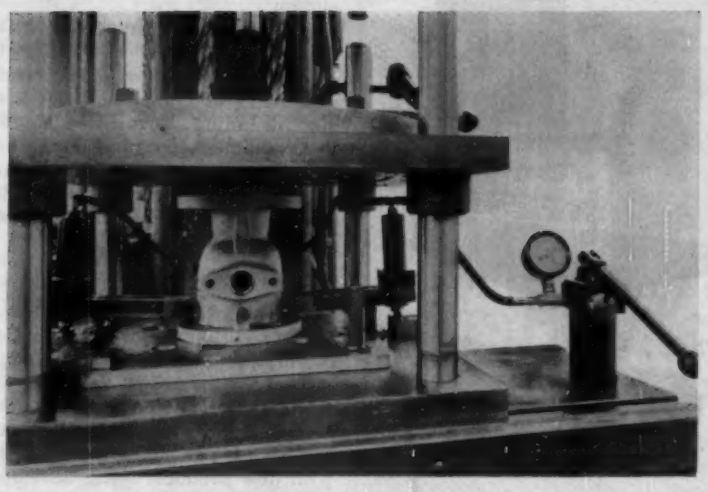
Minneapolis-Moline Co has purchased the fork lift truck business of Lamson Mobilift Corp, Portland, Ore. Acquisition, for an undisclosed amount of cash, covers the assets and distribution facilities of Mobilift and is expected to add $3 million in annual volume to the materials handling equipment manufacturing of Moline.

Loma Machine Licenses British Firm

Loma Machine Manufacturing Co and its subsidiary, Lobeck Casting Processes Inc, of New York have concluded a licensing agreement with the Albert Mann Engineering Co of Basildon, Essex, England. It facilitates the supply of Loma-Lobeck metal processing equipment on a basis of British construction, re-

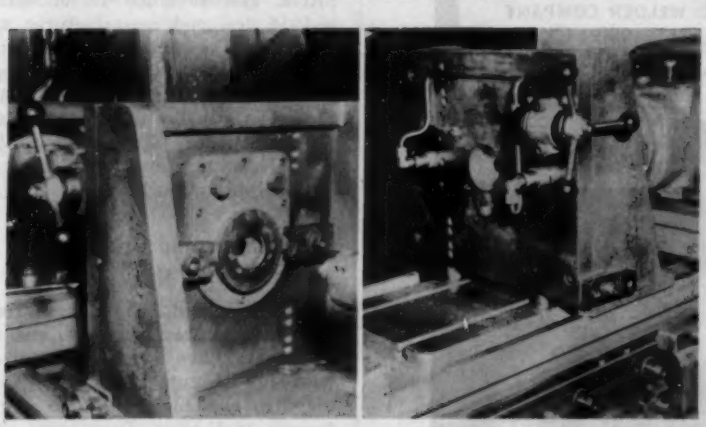
"No, we don't have an opening . . . but stick around . . ."

What other shops found out about Hydraulic Clamping



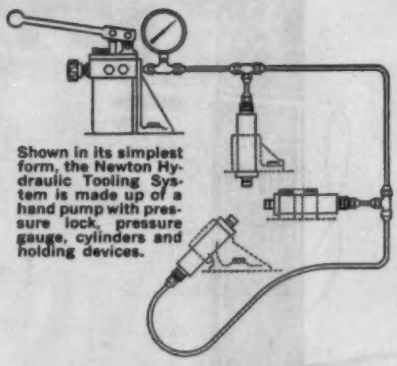
LODDING ENGINEERING SAVES MORE THAN 2½ HOURS A DAY . . . since its switch from manual to Newton Hydraulic Clamping, reports Edward Bedard, Lodding Plant Superintendent. Former manual method took 22 minutes — 14 clamps for each set-up. Newton System reduced number of clamps required to two, with one manual operation. Repositioning takes 4 minutes per set-up which, done 3 times daily, saves nearly an hour in set-ups. Another 105 minutes per day is gained in production time. Total time saved — over 2½ hours a day. Mr. Bedard also states, "We can pay for this unit every two weeks, if we include our installation time." Shown is a multiple drill fixture.

(Lodding Engineering Corporation, Auburn, Mass., is the leading manufacturer of doctors and doctor blades for the pulp and paper industry.)



KINNEY CUTS CLAMPING TIME 90% PER PIECE . . . since the application of Newton Hydraulic Tooling to the clamping parts in a precision boring operation (illustrated above). "Actual clamping time per piece decreased by 90% and floor to floor time decreased by 67%," states Melvin S. Naiman, Tool Engineer at Kinney Manufacturing Co. With the stud and nut arrangement originally used, the machine operator experienced difficulty in tightening clamping nuts with a wrench. "Complete elimination of this drawback," Mr. Naiman reports, "was the result of changeover to hydraulic cylinders. Operator's clamping motions have been reduced to a single rotation of the screw pump handle."

(Kinney Manufacturing Company, Boston, Mass., is a division of New York Air Brake Company.)



Shown in its simplest form, the Newton Hydraulic Tooling System is made up of a hand pump with pressure lock, pressure gauge, cylinders and holding devices.

Further advantages of Newton Hydraulic Clamping

Besides speeding production by reducing set-up time, the Newton System is easy, safe and economical to operate. Uniquely versatile, any number of clamping cylinders can be used up to the fluid capacity of the hand pump. A multiplicity of clamping positions can be achieved — horizontal, vertical, angular, swing, trunnion. Unexcelled for clamping odd-shaped pieces. Clamp pressure is uniform throughout the system, rigidly controlled, indicated by a gauge. Operating pressure is in the 2000 — 2500 psi range. The system is self-contained with no outside source required to maintain pressure. Both screw and lever pumps, equipped with pressure locks, available in two sizes — cylinders in varied size ranges. Air actuated hydraulic pumps, also available in two sizes.

HYDRAULIC SYSTEM PROVIDES:

- **Rapid operation of clamps in jigs and fixtures**
- **Controlled clamping pressure**
- **Self-contained clamping — independent of external power sources**
- **Versatility of clamping applications**
- **Safety, simplicity and economy of operation**
- **A variety of pumps, cylinders and mounting devices**

Send for complete information and catalog.

A Newton engineer will be happy to sit down with you to discuss your particular clamping problem and to give advice on the type of equipment best suited to your needs.

. . . clamps down on set-up time

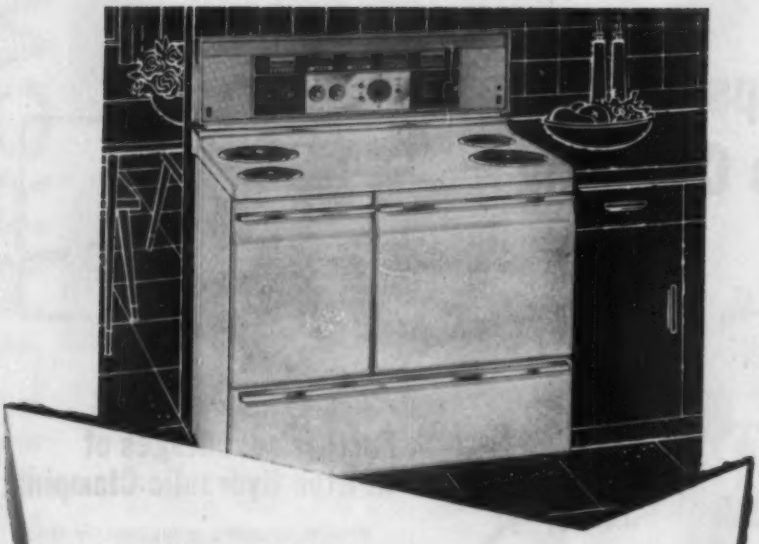
NEWTON

HYDRAULIC TOOLING CO., INC.

AUBURN, MASSACHUSETTS

See Newton Systems demonstrated at Detroit A.S.T.E. Show April 21 — 28
BOOTH NO. 1627

CIRCLE 265 READER SERVICE CARD



Hotpoint relies on . . .

FEDERAL-WARCO

Federal Multi-gun, combination spot and projection welders are a vital link in the exacting production schedules of Hotpoint ranges. The Federal unit shown below welds and forms range frames—adjusts to accommodate five cabinet sizes—maintains high Hotpoint volume without sacrificing quality standards.

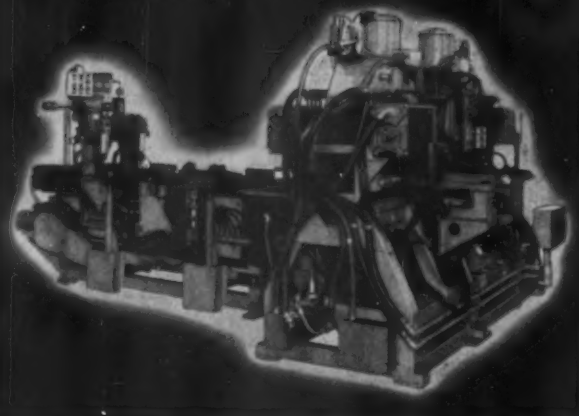
Leading metal fabricators throughout the country have learned they can rely on Federal resistance welders and Warco mechanical presses for dependable high speed performance. Precision engineered to your exact requirement by

THE FEDERAL MACHINE AND WELDER COMPANY
Warren, Ohio

Federal WELDERS

Warco PRESSES

Federal Multi-gun, Combination Spot and Projection Welder #58W3096A-B.



Field Report . . .

sulting in most favorable conditions of delivery, cost, and currency to the firm's customers in the British Commonwealth (exclusive of Canada) and the Outer Seven countries of the European Free Trade Association.

Under terms of the agreement the Mann concern can now offer the range of high production processing machinery of Loma and Lobeck design including billet and slab casting equipment, circular sawing machines, continuous rod and tube drawing, straightening and cutoff lines, and related mechanical handling equipment.

Big Norge Plant for Arkansas

Norge Division of Borg-Warner Corp is building a 1,000,000 sq-ft facility at Fort Smith, Ark. It'll employ 1500 to 2000 and will be used to manufacture Norge's new gas refrigerator and other gas appliances together with new products being developed, also to build and fabricate more appliance components. New plant, with equipment, will cost in excess of $10 million.

$7.9 Million Order to Burroughs

Burroughs Corp, Detroit, has a new contract in the SAGE program of continental air defense. Company, a prime contractor in the Air Force SAGE system since its inception in 1954, designed, manufactures, and maintains the AN/FST-2, a highly complex data processor and computer for the program. Bulk of the contract will be handled at Burroughs' Military Field Service Division headquartered in Radnor, a Philadelphia suburb.

R-O Fixtures and Grinders To Be Built by New Firm

Patent owners of R-O universal form relieving fixtures, grinders, and attachments have signed a contract with RO Manufacturing Co giving the firm exclusive rights to manufacture and sales. Company's new 10,000 sq-ft plant at Madison Heights, Mich, is now in operation.

Heat Treating Firm Expands

Pittsburgh Commercial Heat Treating Co, a division of Cox Industries, is adding over 1500 ft of floor space. Additional facilities will also be added including two new car-bottom furnaces, one of which will be 12

ft wide by 35 ft long, and 8 ft high; these will enable the firm to handle out-size heat treating projects.

Flexonics Leaving Memphis

Flexonics Corp will cancel 400 jobs and a $3 million annual payroll in Memphis, Tenn, as a result of consolidation with seven other Flexonics manufacturing operations under new ownership in Chicago. Calumet & Hecla, Chicago, has acquired all Flexonics stock and will operate it as a subsidiary under its own name. The shutdown, to be completed in one to two years, follows by 20 months the decision by Ford Motor Co to close its assembly plant in Memphis; that cost the area almost 1000 jobs and a $5 million annual payroll.

Howell Buys Diehl Motor Line

Howell Electric Motors Co, Howell, Mich, has acquired the flat-type motor line of Diehl Manufacturing Co, electrical division of Singer Manufacturing Co. Purchase price includes tooling, machinery, and design used in the manufacture of the motors which are widely used in the machine tool industry. Howell plans to produce the newly acquired line at its Leland Ohio Electric Division plant in Dayton.

New Firm Formed to Produce Special Insulated Wire

Carlisle Corp of Carlisle, Pa, and Radiation Applications Inc, New York, have established Irradiated Insulations Inc to produce insulated wire for special requirements in the electronics, aviation, and missile fields. New firm will make use of the production, engineering, and mar-

"Boy! don't have him explain anything while he has a chew of tobacco in his mouth!"

made better

to bring out the Best in Your Products

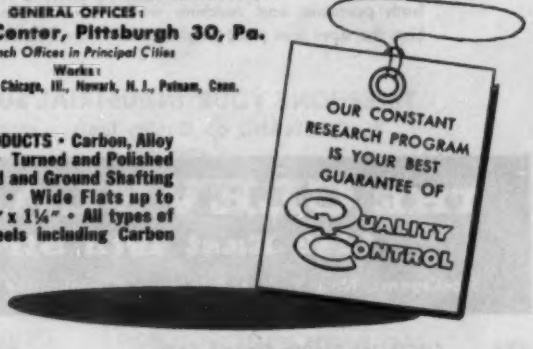
Constant quality and metallurgical control throughout every step in the processing of Wyckoff Cold Finished Steels is your assurance of:

- *Ultimate Machinability*—in any type of screw machine or lathe
- *High Production Rates*—of closely dimensioned, accurate parts
- *Longer Tool Life*—requiring fewer tool grinds; minimum down time
- *Superior Surface Finish*—insuring close control of finished part
- *Physical Properties*—to meet your specifications

Let our metallurgists work with you in selecting the best analyses for your specific requirements.

WYCKOFF STEEL COMPANY
GENERAL OFFICES:
Gateway Center, Pittsburgh 30, Pa.
Branch Offices in Principal Cities
Works:
Ambridge, Pa., Chicago, Ill., Newark, N. J., Putnam, Conn.

WYCKOFF STEEL PRODUCTS • Carbon, Alloy and Leaded Steels • Turned and Polished Shafting • Turned and Ground Shafting • Large Squares • Wide Flats up to 12¾" x 2¼" and 14" x 1¼" • All types of Furnace Treated Steels including Carbon Corrected Steels



You get 4 big advantages with all 4

CLEVELAND *New Style* COUNTERSINKS

1. Easy feeding
2. Long tool life
3. Burr-free holes
4. Better finish

Many tests in customers' plants have proved that the newly designed CLEVELAND New Style Countersinks give *outstanding performance* in all materials . . . on both machine and portable equipment . . . and operate without chatter over a wider range of speeds and feeds than ever before possible.

The High Speed New Style Countersinks (Single Flute and Three Flute) are available in body diameters of ¼" to 1½", with included angles of 60°, 82°, 90°, 100°, 110° and 120° for sizes up to 1", and angles of 60° and 82° for the 1½" size.

The Carbide Tipped New Style Countersinks (Single Flute and Three Flute) come in body diameters of ¼" to 1", with included angles of 60° and 82°.

Write for your copy of this Helpful New Folder

Gives recommendations for countersinking holes in various materials, in both portable and machine work. Illustrates methods of regrinding. Lists the sizes and point angles of the new Countersinks.

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR
for CLEVELAND Quality Tools . . . *prompt delivery from stock*

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York • Atlanta • Cleveland • Detroit • Chicago • Dallas • Los Angeles • San Francisco

Field Report . . .

keting experience in high-temperature wire and cable of Carlisle's subsidiary, Tensolite Insulated Wire Co, Tarrytown, NY, while RAI, a technical concern specializing in nuclear, chemical, and plastics research for industrial applications, will provide the research staff and facilities for developing new products. A line of wire and cable insulated with irradiated polyethylene will be the first product to be marketed by the new company. Development work on this material has been under way at RAI for some time.

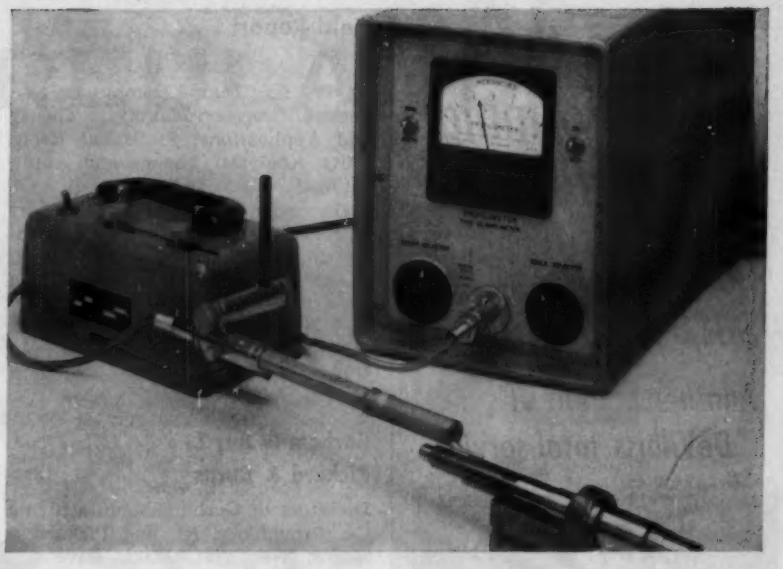
Dow Forms New Company in Italy

Dow Chemical International Ltd SA plans to establish a new company, Dow Chimica Italiana SpA, and to construct a multi-million-dollar manufacturing plant in Italy. The wholly owned subsidiary will open its marketing office this month in Milan. Plans for the location of the plant have not been completed but a number of products are being considered, one of which is the entire Styron line (Dow polystyrene plastic).

Industrial Engineering Seminars Scheduled by Cornell University

Annual seminars sponsored by Cornell's Sibley School of Mechanical Engineering will be held June 14 through June 17 at the University in Ithaca, NY. Participants will attend general sessions and also enroll in one of the following seven groups: Industrial Management; Engineering Administration; Operations Management of the Smaller Company; Work Measurement; Systems Simu-

"Emergency call? Why get excited? All our calls are emergency!"



PERTINENT QUESTION:

WHEN do you need the Profilometer®?

FACTUAL ANSWER:

Whenever you must precisely *know* the roughness of *any* production surface — quickly, dependably, in microinches (arithmetical or rms).

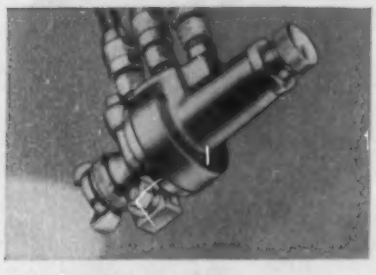
FREE BULLETIN LT14 gives details — describes cost-saving applications. May we send you a copy?

MICROMETRICAL MMC® MANUFACTURING COMPANY
345 S. MAIN ST. ANN ARBOR 1, MICHIGAN

Manufacturer of the PROFILOMETER®, PROFICORDER®, MICROCORDER®, WAVOMETER®, ANDEROMETER®, VAROMETER®, CHART VIEWER • Exclusive American Sales Agent for CENSOR Dimensional Gaging and Sorting Equipment

Increase the life of forming and cutting tools with spray cooling

Another benefit of DeVilbiss total service



Use DeVilbiss WDB spray gun for heavy-duty, high-volume applications. Continuous or intermittent spray (up to 60 spray cycles/min). Manual or automatic control.

DeVilbiss Multi-Mister is designed for jobs requiring continuous or intermittent fine spray mist. Complete with one- or five-gallon tank, one to four spray nozzles.

• • •

Write for complete data to: The DeVilbiss Company, Toledo 1, Ohio.

FOR TOTAL SERVICE, CALL

DEVILBISS

Field Report . . .

lation Using Digital Computers; Statistical Decision-Making: Theory and Applications; Statistical Reliability Analysis: Theory and Applications.

Discussion leaders and speakers will be specialists from both industry and the University staff. Additional information can be obtained from J W Gavett, Seminars Coordinator, Dept of Industrial and Engineering Administration, Upson Hall, Cornell University.

Gorham to Buy Pickard & Burns

Directors of Gorham Manufacturing Co, Providence, RI, and Pickard & Burns, Needham, Mass, have approved terms of the acquisition by Gorham of all of the assets of Pickard & Burns. Latter company is engaged in electronic navigation, communications, radar systems and instrumentation, an dis presently a prime defense contractor. Gorham, world's leading silversmith, has, over the last fifteen years, established itself as a space-age producer of precision components in microwave and electronic equipment, supplying many major electronic firms as well as contracting directly with the government. It has recently established an engineering and R&D group within its Electronic Division.

Synthane West Coast Production

Synthane Corp, Oaks, Pa, manufacturer of industrial laminated plastics, has set up new fabricating and warehouse facilities in Glendale, Calif. The firm has been represented on the West Coast for some years, but basic fabricating services are now being offered for the first time outside the main plant near Philadelphia.

Chris-Craft to NAFI?

NAFI Corp, formerly National Automotive Fibres Inc, Oakland, Calif, is eyeing Chris-Craft Corp, manufacturer of pleasure boats. Acquisition is subject to approval by NAFI's directors and by stockholders of both companies. Under the plan, Chris-Craft would continue to operate under its own name; directors would resign, however, upon completion of the transaction. NAFI manufactures interior trim for automobiles and, since 1958, has diversified into television, radio, and oil and gas producing properties. Chris-Craft has boat-making facilities in Florida, Michigan, Missouri, Tennessee, and Maryland.

Sperry Gyroscope . . .

. . . will build an advanced research center in Sudbury, Mass. First unit, containing 65,000 sq ft and employing 200, will be completed in about a year and a half. A 35,000 sq-ft addition planned for later will bring eventual employment up to the 750 mark.

Hupp Buys Valve Business

Hupp Corp, Cleveland, has acquired in a cash transaction the manual valve operator business of Jones Machinery Division, Hewitt-Robins Inc. Purchase includes tooling, inventory, and engineering designs. Hupp has moved operations to its Aviation Division in Chicago and is now in production on all standard sizes.

Airco Building in Florida; Other Divisions May Move Later

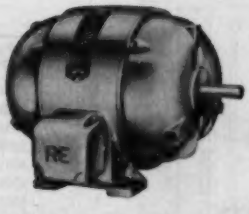
Air Reduction Sales Co, a division of Air Reduction Co, will start construction this month of the first commercial liquid air separation plant in Florida. The multi-million dollar installation at Tampa will have a production capacity of 25 tons of high purity liquid oxygen per day as well as liquid nitrogen and liquid argon. Completion is scheduled for summer. It's expected that other divisions of Air Reduction will also locate at the Tampa site in the future.

(Continued on p 179)

"Just widen all the doors in the plant starting with that one and never mind WHY!"

WHO BUT REULAND WOULD OFFER AN

HONOR SYSTEM MOTOR SERVICE POLICY?



15-Year-Old Service Policy Takes the Word Of Any Local Electric Motor Service Shop of Your Choice

Here is another indication of Reuland quality... and the extent to which our company stands behind its products. It is based on a trust in people, and a trust in Reuland workmanship. It has met the test of time, and captured the acclaim of Original Equipment Manufacturers... and *their* customers.

Whether *your* company is an O.E.M., or a User, the Reuland Honor System Service Policy can be your passport to uninterrupted machine operation. If you are tired of delays while service responsibility is determined... if you would like to talk to a motor company that can look you straight in the eye and be measured, your experience with Reuland could be a revelation.

A free copy is available on request. Explains the simple steps to take. Shows how Reuland's unique philosophy of doing business permits it to offer the industry's only Honor System Service Policy! All company officials should have a copy. We'll mail yours promptly.

MODERN POWER FOR MODERN DAY PRODUCTS
...all in lightweight aluminum frames!

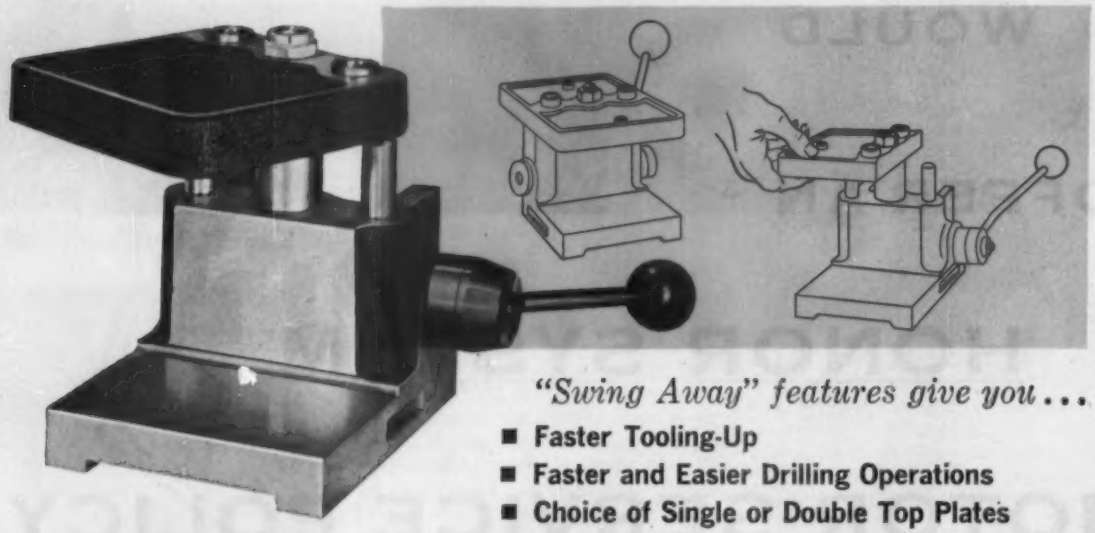
REULAND MOTORS RE

REULAND ELECTRIC COMPANY
WESTERN DIVISION: *Alhambra, California*
EASTERN DIVISION: *Howell, Michigan*
Distributors in all Principal Cities

Refer to Sweet's 1960
Product Design File
Section 5a

tool quickly for long or short runs!

ABC LIFT SWING DRILLING FIXTURES

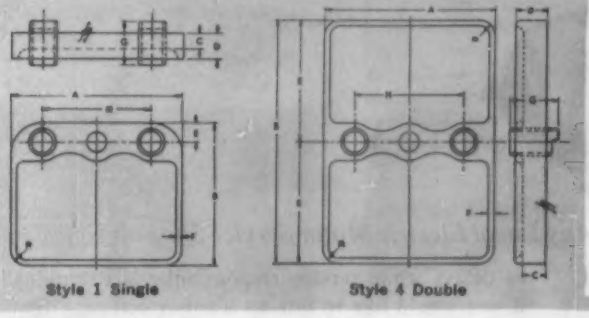


"Swing Away" features give you . . .

- **Faster Tooling-Up**
- **Faster and Easier Drilling Operations**
- **Choice of Single or Double Top Plates**

INTERCHANGEABLE TOP PLATE ENGINEERING DATA

Top Plate Dimensions



Style 1 Single — Style 4 Double

Top Plate Sizes

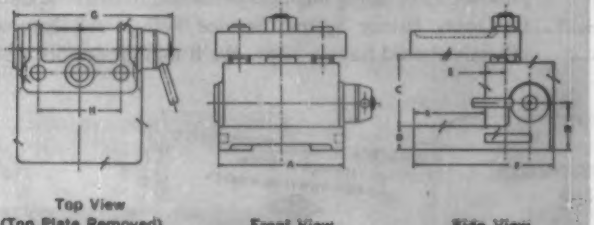
Top Plate Style	Top Plate Number	A	B	C	D	E	F	G	H	R
1	2201	2⅛	2⅛	½	½	7/16	—	⅜	1½	5/16
4	2204	2⅛	3⅛	½	½	1 1/16	—	⅜	1½	5/16
1	3201	3⅛	3 7/16	½	½	⅛	—	1	2½	⅝
4	3204	3⅛	5⅛	½	½	2 13/16	—	1	2½	⅝
1	4201	4⅛	3⅛	½	⅛	⅛	5/16	1	2½	½
4	4204	4⅛	6⅛	½	⅛	3⅛	5/16	1	2½	½
1	5301	5½	5	⅛	1	⅛	5/16	1⅛	3½	⅝
4	5304	5½	8⅛	⅛	1	4⅛	5/16	1⅛	3½	⅝

Larger sizes and other style single top plates available.

IMPORTANT: When ordering Complete Assembled Lift Swings, specify first 3 digits of Base Number and 1 or 4 to indicate the style of Top Plate desired. EXAMPLE: LS-3221 = 3220 Base with 3201 (Style 1) Top Plate.

FIXTURE BASE ENGINEERING DATA

Fixture Base Dimensions



Top View (Top Plate Removed) — Front View — Side View

Fixture Base Sizes

Lift Swing Base Number	A	B	C	C Shut suggested max. clamp	C Open	D	E	F	G	H	R
2220	2⅛	1⅛	1½	1¾	2¼	1	½	3⅛	3¼	1½	1 5/16
3220	3⅛	2⅛	2	2⅜	3	1	⅝	4½	5	2½	1 1/16
4220	4⅛	2⅜	2½	2⅞	3½	1	⅝	5	5¼	2½	1¾
5330	5⅛	3⅛	3	3¼	4⅛	1	1	6¼	6¼	3½	2
5340	5⅛	3⅛	4	4¼	5⅛	1	1	6¼	6¼	3½	2
5350	5⅛	3⅛	5	5¼	6⅛	1	1	6¼	6¼	3½	2

Larger sizes available. For tooling suggestions and complete engineering data write for Catalog LS-58.

ACCURATE BUSHING COMPANY

440 North Avenue, Garwood, N. J.

Field Report . . .

Japanese Starfighters

Licensing agreement has been signed by Mitsubishi Heavy-Industries Reorganized Ltd, Tokyo, and Lockheed Aircraft International for the manufacture and sale of Lockheed F-104J Starfighters. Mitsubishi will launch domestic production of 180 of the supersonic jet fighters for use by the Japanese Air Self-Defense Force.

Waltham Acquisition

Waltham (Mass) Precision Instrument Co has purchased the Electric Motor Division of Advanced Products Co, North Haven, Mass, and moved it to Waltham. This enables the firm to add a new product line of subminiature synchronous motors to its growing list of aircraft, missile, and electronic components. Waltham has also set up a Small Tools Division for marketing of a complete line of micro-miniature cutting tools.

Horkey-Moore Expands

Horkey-Moore Associates of Torrance, Calif, has formed a Plastics Division that'll specialize in the application and extension of reinforced plastics technology to missiles, aircraft, and space vehicles, as well as commercial and industrial products. Division will be housed in a new engineering and factory building under construction next to the main facilities. Equipment to be installed will permit fabrication of high temperature and high pressure resistant plastic components of very large size. Employment is scheduled to reach 100 by end of the year.

"No, not a bit of trouble . . . Harry, don't forget to insert those bearings . . . I really had no idea it would be so easy to repair . . . Harry, better line up those replacement gears and don't forget those lock washers."

for the man who's HAD IT

Columbus Die-Tool can help!

Many leading companies all over the United States are now availing themselves of our creative engineering staff, modern plant and equipment, to design and build their special tools, jigs, fixtures and machines. Over 50,000 square feet, filled with precision production equipment, enables us to build fine tools and special purpose machines to your exacting requirements. Increase the efficiency of your operation with special tools that do the job better—faster—more economically . . . designed and made by Columbus Die-Tool.

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AND MACHINE COMPANY

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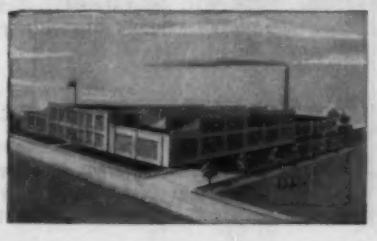

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Built to handle a wide variety of parts—sizes and shapes—the OBE's versatility and rugged design make it a valuable asset in integrating and automating production line operations. Even and continuous flow is provided. Costly and tedious manual operations are eliminated.

Special Features Include:

- High-speed feeding of a wide range of part sizes and shapes.
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- Variable speed drive to meet machine demands.
- Large storage capacity.
- Automatic feed controls and special orientation devices available. Right- or left-hand discharge to suit your needs.
- Rugged construction — standard components.
- Ease of maintenance—all parts readily available.

Write for complete details on the new RCA Orienting Belt Elevator. Also ask about RCA's full line of automatic feeding equipment.

RCA Trade(s) ®

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Field Report . . .

Big New Plant for Kelsey-Hayes

Kelsey-Hayes Co, maker of wheels and rims for automobiles, will build a $4 million plant in Romulus Township, Mich. Company's entire wheel manufacturing operation is expected to be moved from Detroit to the new location. New unit which will take at least a year for completion will be an addition to facilities bought last October—a Navy jet plant which K-H purchased from the General Service Administration for $2.2 million.

Remington Rand Engineering Center Going Up Near Philadelphia

Remington Rand Division of Sperry Rand Corp has begun construction of a multi-million-dollar engineering center on a 100-acre site in Pennsylvania. Scheduled for completion by end of the year, it'll consist of two buildings with total floor space of 304,200 sq ft. Division, which developed the Univac computers, will employ about 1500 at the facility which will house the country's largest computing center.

Aero Supply Buys Into International Ultrasonics

Agreement concluded between Aero Supply Mfg Co, Corry, Pa, and International Ultrasonics Inc, Rahway, NJ, includes options for Aero to acquire up to 50% of International. Aero will assist in financing production of a new ultrasonic continuous seam welder for aluminum foil and other thin metals. First such unit will be installed soon at the Richmond, Va, plant of Reynolds Metals; it can weld foil as thin as 0.00025 in.

Fairbanks, Morse to Build Engines for Navy Tender

Fairbanks, Morse & Co has a contract to build the propulsion engines and electric generator sets for a Navy tender for Polaris nuclear submarines. Vessel is designed as a seagoing port for as many as six nuclear subs. Work will be carried out at the company's heavy machinery plant at Beloit, Wis.

New Firm in Miami

Anodyne Inc, a new multi-color anodizing and etching firm, is opening a 28,500 sq-ft plant in Miami's Sunshine State Industrial Park. When in full operation the newly formed Anodyne will be the parent company of North Shore Nameplate Inc, Bayside, NY, manufacturer of (among other products) anodized etched, pressure-sensitive, aluminum foil nameplates. Anodyne's initial operation will begin around the middle of the month on semi-integrated basis; complete integration is expected in June with North Shore becoming a division. Company reports that its primary reason for moving to Miami is to build a plant around physically handicapped people, feels there's a labor pool with a higher rate of productivity and less turnover than found elsewhere in the country.

RCA Gets $8 Million Order

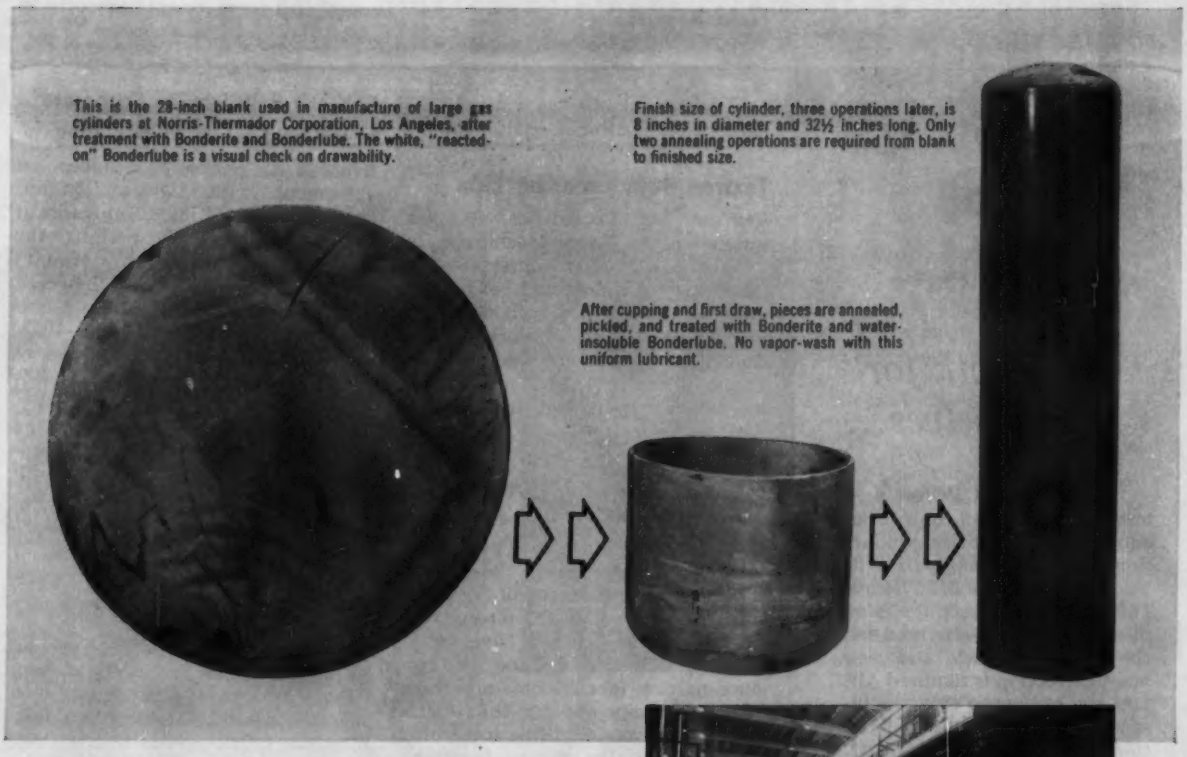
RCA in Camden, NJ, has a contract for continuation of production engineering on the micro-module production system for electronic equipment. Order includes development of miniaturized Signal Corps communications and computer equipment, one-tenth the size of transistorized equipment, and the production of helmet radio transmitter-receivers weighing only eight ounces.

Savoy Industries Opens Plant in Bahamas

Transelectronics Ltd, a wholly owned subsidiary of Savoy Industries Inc, has opened a new electronic component plant in Freeport, Grand Bahamas. Initially the entire output of the Freeport facility will be used by Savoy plants at Fort Lauderdale, Fla, and Griffin, Ga. Cheaper labor and tax advantages prompted the company to put up the plant in the Bahamas instead of in this country.

Facility employs 100 people and this will rise to over 200 in a year as production expands. The Freeport plant will soon make its com-

"He's the temperamental type of foreman . . . 90% temper and 10% mental."


This is the 28-inch blank used in manufacture of large gas cylinders at Norris-Thermador Corporation, Los Angeles, after treatment with Bonderite and Bonderlube. The white, "reacted-on" Bonderlube is a visual check on drawability.
Finish size of cylinder, three operations later, is 8 inches in diameter and 32½ inches long. Only two annealing operations are required from blank to finished size.
After cupping and first draw, pieces are annealed, pickled, and treated with Bonderite and water-insoluble Bonderlube. No vapor-wash with this uniform lubricant.

Increased production at lower costs, real savings with BONDERITE and BONDERLUBE in cold drawing

The press room at Norris-Thermador, Los Angeles. (Photos courtesy Norris-Thermador Corp.)

In heavy drawing operations like those illustrated, high lubricant film strength is vital. BONDERITE, an integral phosphate coating on metal, and BONDERLUBE, chemically combined with the BONDERITE coating, produce an unexcelled, tough film that continues to act as a separating layer even when the surface area worked is increased several times.

This tough integral film moves along with the metal surface. So, you can get greater reductions, use double pass operations and can produce millions of parts without change in your die setup. Results are expanded press productivity and real cost savings.

A further, major source of savings is the reduction in number of necessary process anneals, substantially decreasing handling, pickling and relubricating costs. Even better, with reactive BONDERLUBE, lubricant costs are frequently reduced to a fourth of the former cost.

AIDS ANY SEVERE IRONING OPERATION

If you draw tubing, wire, bumper bars, frame members, motor mounts or do other severe drawing operations on steel plate, BONDERITE and BONDERLUBE will lower forming costs in your plant. Parker's staff of specialists will be sure you get the right combination to raise production and save you money. Write us today.

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BONDERITE corrosion resistant paint base • BONDERITE and BONDERLUBE aids in cold forming of metals • PARCO COMPOUND rust resistant • PARCO LUBRITE—wear resistant for friction surfaces • TROPICAL—heavy duty maintenance paints since 1883

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to think for themselves...

The *MICROtrol** system of machine tool control can automate your entire production cycle . . . or *any part* of it. You can adapt the *MICROtrol* 160 System to inspect each piece, sort out rejects, and tell the operator *when* and *how much* correction is required. Or, you can automate only the inspection or the sorting operation . . . according to your needs.

You can choose from 54 control components that can be combined to attain any stage of automation in . . .

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The components are easy to install, and simple to use. The system is completely flexible, and can be adapted to your operation all at once . . . or in stages.

LET US SHOW YOU HOW

The *MICROtrol* System will improve your plant's production capability. One of our field engineers will survey your operation, tell you which *MICROtrol* elements you need.

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DEER PARK, LONG ISLAND, NEW YORK
A DIVISION OF CUTLER-HAMMER, INC.

Field Report . . .

ponents available to other US makers of electronic equipment.

Textron Buys Canadian Firm

Textron Inc, Providence, RI, has purchased the Terry Machinery Co Ltd of Montreal, manufacturer of pumps, generators, and electronic systems. The firm, which also performs special contract work for the Canadian government, has had an annual sales rate of $6-$8 million and has subsidiaries in British Columbia, Alberta, Ontario, Quebec, and Nova Scotia.

Fletcher Works . . .

. . . Philadelphia has purchased Turner Manufacturing Co, Statesville, NC, manufacturer of farm implements and valves. Company will operate as the Turner Division of Fletcher Industries Inc and will produce narrow fabric looms and yarn twisting equipment for the textile trade. Production will be integrated between Fletcher Works in Philadelphia, Fletcher Southern in Southern Pines, NC, and the new division. Turner facilities will be supplemented by new, specialized equipment for production of the looms; manufacture of farm implements and valves will be continued if advisable. Plant is expected to hire about 100 people during the next ten months.

Molded Insulation Co . . .

. . . Germantown, Pa, has $1.5 million contract for 80,000 radiosondes for the Signal Corps. The electronic instrument packages are used with weather balloons to relay weather data to ground stations.

National Lead and Brazilian Firm Form Diecasting Company

National Lead Co and Companhia Industrial e Comercial Brasmotor of Sao Paulo, Brazil, have established a new concern to manufacture diecastings for Brazilian markets. Company, Industrias Doehler do Brasil S A, has completed installation of manufacturing equipment and is starting production at its new plant. It'll manufacture zinc and aluminum diecastings and will have as a primary market the growing automotive industry of Brazil. It'll also supply Brazilian manufacturers of appliances and machines with diecast component parts for appliances, hand tools, and business machines.

Babcock & Wilcox to Cooperate In Italian Nuclear Shipbuilding

Babcock & Wilcox has signed an agreement with Cantieri Riuniti Dell' Adriatico (United Shipyards of the Adriatic) which permits the Italian shipbuilding concern to build and sell merchant vessels powered by nuclear propulsion plants based on B&W designs and patents. B&W will furnish technical assistance to CRDA for nuclear-propelled ships to be sold both within and outside Italy. Pact covers a ten-year span dating from Jan 1 of this year. The century-old CRDA organization, with 17,000 employees and four Italian shipyards, is one of Europe's major shipbuilding enterprises.

Faradyne Buys Castings Firm

Investment Casting Co, Springfield, NJ, producer of ferrous and nonferrous investment castings, has been acquired as a subsidiary of Faradyne Electronics Corp, Belleville, NJ, which will expand existing facilities.

Howe Sound Acquires Triplett & Barton

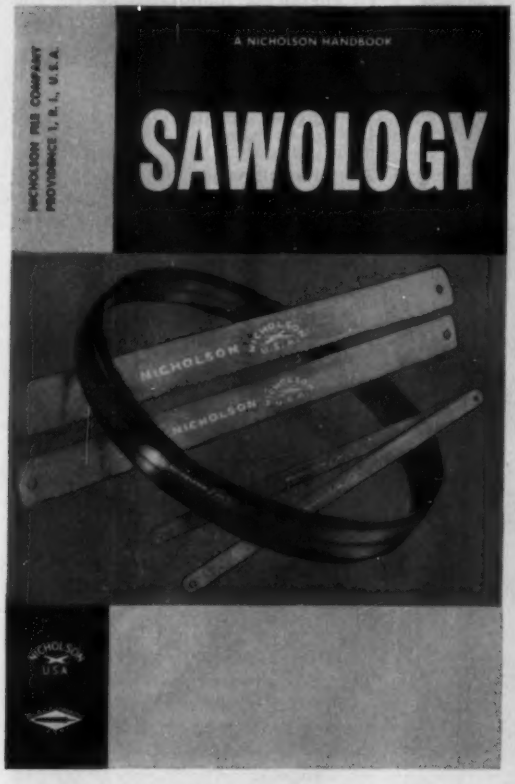
Howe Sound Co has acquired all outstanding stock of Triplett & Barton Inc, Burbank, Calif, manufacturer of portable industrial X-ray equipment. Company's products will be distributed through the sales organization of Sperry Products Co, a division of Howe, located in Danbury, Conn.

Testing laboratories are maintained by T&B in Burbank and in Wichita, Kans. Both facilities will be maintained by Sperry; T&B manufacturing operations, however, will be moved to the Danbury plant.

Allis-Chalmers to Build Big Engine Manufacturing Plant

Construction of a multi-million-dollar plant for the Harvey Works will begin immediately on 35 acres acquired by the company in 1957 and on which it has put up an engineering and development research lab that has been in operation since 1958. New facility will add 515,000 sq ft to the 654,000 sq ft of Plant No. 1 and Plant No. 2 which comprise the Harvey Works at present. New plant will enable A-C to build a broad line of diesel, natural gas, butane, and gasoline engines.

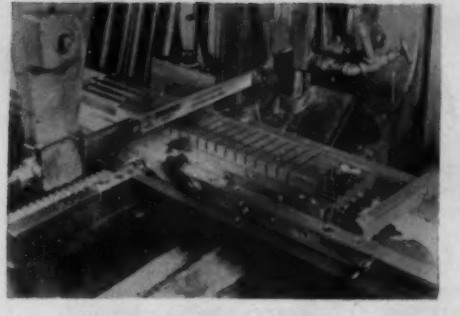
FREE! FROM NICHOLSON—34-PAGE HANDBOOK ON METAL-CUTTING SAWS. SEND FOR YOUR COPY TODAY!



Material	Teeth Per In.	Strokes Per Min.
FERROUS		
Drill Rod	10	90
Forging Stock, Alloy	4-6	90
Forging Stock, Mild	3-4-6	120
Iron, Cast	6-10	90-120
Iron, Malleable	6-10	90
Rails	6-10	60-90
Steel, Alloy	4-6	60-90
Steel, Carbon Tool	4-6	90-120
Steel, High Speed	6-10	60-90
Steel, Machinery	3-4-6	90-120
Steel, Stainless	3-4-6	60-90
Steel, Structural	6-10	90-120
Steel, Die Blocks	4-6	60-90
Steel Pipe	6-10	120
Tubing, Thick Wall	6-10	120
Tubing, Thin Wall	14	120
NON-FERROUS		
Aluminum	3-4-6	120
Babbitt	4-6	120
Brass Castings, Hard	4-6	90-120
Brass Castings, Soft	4-6	120
Bronze Castings	4-6-10	90
Bronze, Manganese	6-10	60-90
Copper Bars	3-4-6	90
Copper Tubing	10	120
Monel Metal	4-6	60-90

This chart *(left)* has been developed as a helpful guide in selecting the best blade tooth and stroke speed for ferrous and nonferrous materials.

This picture *(below)* shows the use of a power blade holder extension, which for certain cutting jobs permits the use of a shorter blade in the machine . . . reducing cost.



Handy textbook manual contains complete and useful information for shop superintendent, production foreman, mechanic, machinist, maintenance man, purchasing agent, mechanical trainee . . . everyone connected with the management and operation of your shop, plant or industry.

HERE'S a book that can save you money. It's the first of its kind dealing with the manufacture, proper selection, effective use of saws for cutting ferrous and nonferrous metals, hard plastics and rubber, wood . . . other dense materials.

It was written especially for Nicholson and draws upon all our facilities, skills and experience with metal-separating jobs and appropriate tools.

Following is a partial listing of topics discussed: "How to get the most out of hand hacksaw blades," "Power hacksaw tooth selector," "Hints on the use and care of power hacksaw blades," "Band saw blade and tooth selector," "Friction sawing," "Contour sawing."

Pages are illustrated with numerous photographs and diagrams. Text is straightforward in easy-to-understand terms for *everyone* who deals with metal sawing.

"Sawology" has just been published and is now available. It is designed to help you make the most efficient and economical use of all metal-cutting blades. And it's available without cost to you. Just clip and mark the coupon.

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GROUND FLAT STOCK • INDUSTRIAL HAMMERS

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Save Now! Include an ELDORADO Gun Drill in your drilling plans. If you need a solution to your 'hole' problem, avail yourself of ELDORADO'S experience and research facilities. Write for full information.

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OA Lengths	4" to 120" with dia. limits	10", 16", 22", 36"	16", 22", 36"
Drivers	Std. or to fit your need	.750" dia. x 2 1/4" long	1" dia. x 2 1/4" long
Tips	Carbide	Carbide	Carbide
Now, order from stock, or send in your specifications for a prompt quotation.			

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Field Report . . .

Barium & Chemicals Inc . . .

. . . Willoughby, Ohio, has purchased a 165,000 sq-ft plant at Steubenville. Facility, located on a 37-acre tract of land, will greatly increase capacity for production of high purity barium and strontium compounds, and other chemicals manufactured by the company for industry.

Bendix Computer to Add To California Plant

The Computer Division of Bendix Aviation plans to build a new manufacturing plant and increase marketing facilities by 50% during 1960. New building to go up next to the division's headquarters in Los Angeles will be used for continued manufacture of the medium-size G-15 digital computer and its many accessories as well as for production of a new line of high-speed transistorized computing equipment.

Federal Pacific Moving To Acquire Cornell-Dubilier

Stockholders of Federal Pacific Electric Co, Newark, NJ, have approved plans of the company to acquire all or as many as possible of the outstanding common shares of Cornell-Dubilier Electric Corp, South Plainfield, NJ, producer of capacitors and electronic components. C-D would be operated as a consolidated subsidiary if its stockholders accept the exchange offer.

Federal Pacific has just received a $1.1 million Army contract for 5-kv metal-clad switchgear assemblies for six Titan missile launching sites located in the Pacific Northwest. Shipments are scheduled for completion by end of the year.

"Hello, dear, I've brought some work home."

KUMMER

NEW Semi-automatic Chucking Machine K-20

represented exclusively by

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NOW INCLUDING:

- Electronic drives and controls
- Multi-method chucking
- Larger and heavier construction
- Cam shaft accelerator

The CARL HIRSCHMANN COMPANY INC. proudly introduces the New KUMMER K20 and stands ready to back it up with the traditional HIRSCHMANN service.

The KUMMER K20 Semi-automatic Chucker now adds electronic drives and controls, multi-method chucking and larger and heavier construction to its many features to make it one of the most versatile machine tools in the shop.

The KUMMER K20 is two machines on one base. It doubles operator productivity and increases output.

A machine tool of the HIGHEST PRECISION, the K20's cam controlled tool slides carrying up to three tools for each independent head, permit automatic turning, boring, drilling, contouring and generating with SINGLE POINT TOOLS.

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MEMOS

by BESS RITTER

Although King Solomon is noted for his vast collection of wives, his real claim to fame deserves to be the great blast furnace that he built in the Arabah desert near a city known as Ezion-Geber, in Palestine. The furnace was constructed in a style similar to the Bessemer system discovered by modern smelters a century ago, only instead of using compressed air which is forced through bellows, Solomon utilized the winds of the desert in combination with a series of flues.

The extensiveness of the operations can be estimated by the size of the smelting pots found by the archaeologists. They're big enough to hold 14 cubic feet of material. The area contained a collection of copper mines, was known to the ancient world as the center of the copper industry. It is believed that this is where all those beautiful brass and copper ornaments were made to furnish the Temple at Jerusalem.

According to the archaeologist Nelson Glueck, who discovered this furnace, King Solomon was actually the Copper King of the Orient, and Ezion-Geber, Palestine, was the Pittsburgh of its day. He also had iron smelting installations in an area south of the city of Gaza, which were eventually unearthed by the archaeologist Flinders Petrie.

All of which is neatly hinted at in the Bible in Deut. 8:7-9, where the area is described as "a land whose stones are iron and out of whose hills thou mayest dig brass." However, this phrase was so incomprehensible to Bible students in even comparatively modern times that they ignore it in many of their commentaries.

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 MACHINE TOOLS — *Giddings & Lewis Machine Tool Co, Fond du Lac, Wis.* 12-page condensed catalog 60 illustrates and describes complete line of currently standard G&L machine tools. Includes horizontal boring, drilling, and milling machines and accessories; vertical turret lathes; vertical boring mills; upright and radial drilling machines; planer mills; and planers. All are described as being available with punched tape, discrete positioning, or magnetic tape continuous-path controls.

2 NUMERICALLY CONTROLLED MACHINES—*Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich.* 20-page Guide Book contains basic information and approximate costs of getting into tape controlled operations. Covers fundamentals of numerical control; how the different types operate; what Numera-Trol is; questions and answers.

3 MULTIPRESS—*Denison Engineering Division, American Brake Shoe Co, 1160 Dublin Rd, Columbus 16, Ohio.* 24-page bulletin 120 describes versatility of the unit with special emphasis on new models. Applications discussed; case histories illustrated. Complete line of control valves and other accessories covered.

4 BARNESDRIL MACHINES — *Barnes Drill Co, 820 Chestnut St, Rockford, Ill.* 8-page bulletin GC-60 pictures and provides data on complete line of equipment including transfer machines, production units, programming machines, standard drills, honing machines, and coolant cleaning equipment. Illustrations cover applications and parts.

5 POWER TOOLS—*Boice-Crane Co, 935 W Central Ave, Toledo 6, Ohio.* 44-page catalog 60 describes and illustrates lines of bandsaws, contour saws, jig saws, saw tables, saw-jointers, jointers, belt sanders, spindle sanders, shapers, shaper cutters, lathes, planers, drillpresses, band filers, grinders, and spinning tools. New Golden Anniversary models are included.

6 GRINDER ATTACHMENT — *Landis Tool Co, Waynesboro, Pa.* 4-page bulletin M-60 illustrates and describes the Mechanical Micro-Swivel for sensitive swivel table adjustments on new Landis cylindrical grinders.

"This was taken of my husband in the year 1947—before automation."

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PEORIA 3-8171
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ROCKFORD 2-7711
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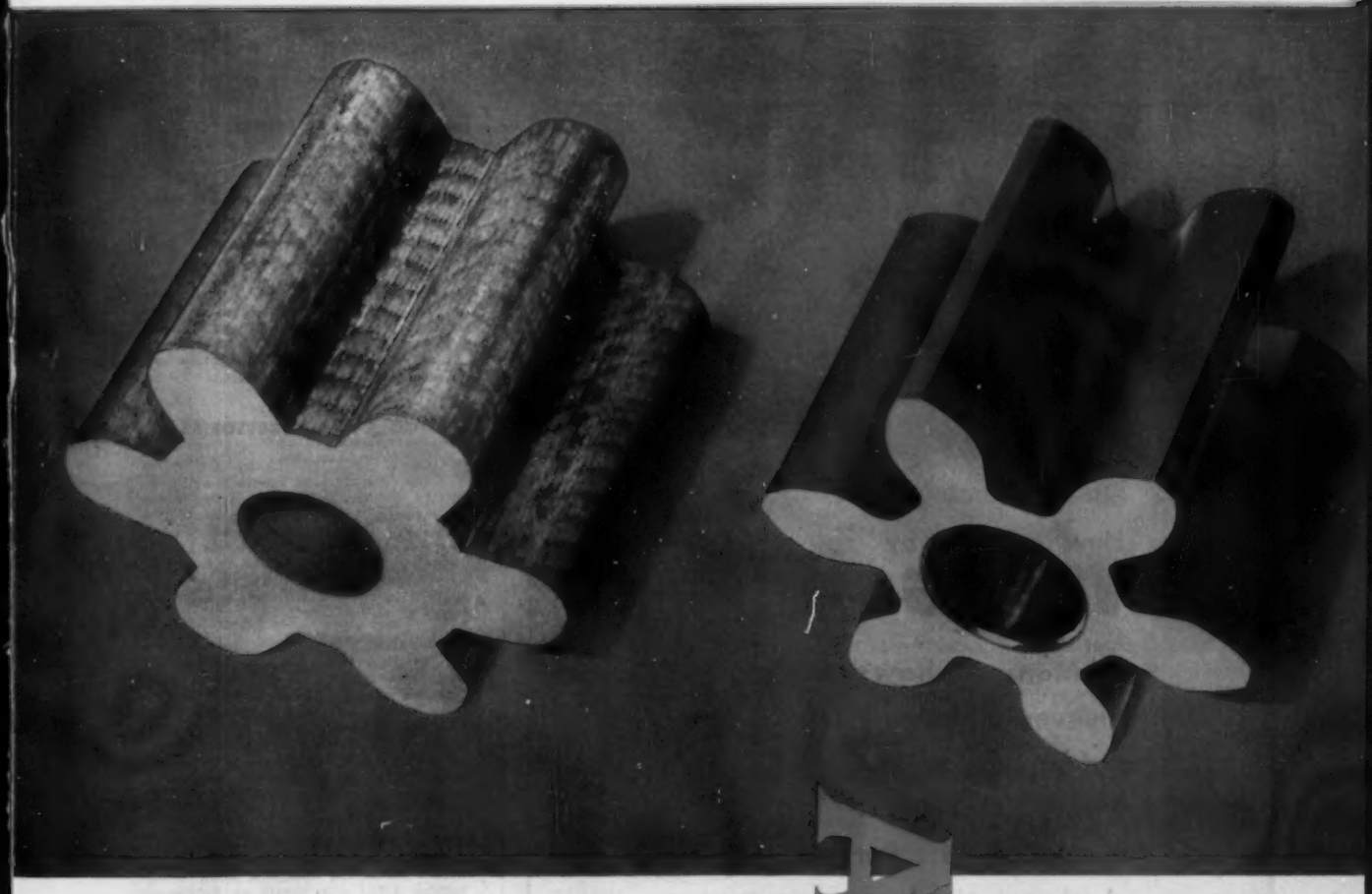
CIRCLE 280 READER SERVICE CARD



Note minimum clean-up necessary between casting of this 6-tooth pump impeller and finished part. (Illustrated parts are 4" in diameter.)

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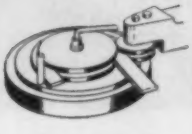
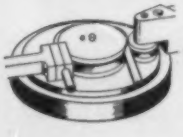
CIRCLE 281 READER SERVICE CARD

How to form it by

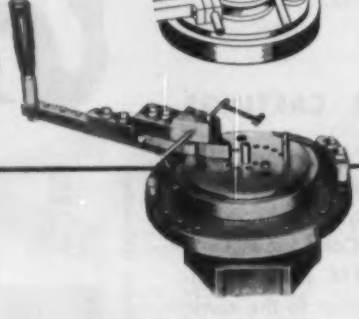
BENDING ...





Free Manual shows techniques of forming round, square, or hex bar stock ... tubing ... channel ... angle ... flat and other materials.

Di-Acro Hydra Power Bender



Di-Acro Hand-Operated Bender

It's easy to bend a wide variety of material when you know how—profitable too because bending can simplify product design—make one curved piece do the job of two or more. Bending can improve product appearance and lower your production costs!

This 32-page illustrated manual shows how to make center eye and off center bends, circles, zero radius bends, scrolls, squares, springs and coils, loops and spirals—all with *one versatile machine*. Booklet also tells how to tool for tubular, channel, angles and other special bending needs.

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To order any of these bulletins, circle corresponding number inside back cover.

7 INTERNAL GEAR SHAVING MACHINE—*National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich.* 8-page bulletin S-60-1 provides detailed information on Model GCR-12 that will precision shave all spur or helical internals 3 to 12 in. PD up to 4 diametral pitch with face widths to 2½ in. Design and operating features illustrated.

TOOLS AND ACCESSORIES

8 SAW BLADES—*Ladish Co, Cudahy, Wis.* 36-page handbook and catalog 578 contains guides for getting maximum cutting performance and blade life. Shows how to select proper blade, correct feed, speed, and tension. Common cutting problems and solutions tabulated with recommendations for cutting a wide variety of metals and non-metals. Sizes and types of blades listed.

9 PROFILOMETER — *Micrometrical Manufacturing Co, 345 S Main St, Ann Arbor, Mich.* 8-page bulletin LT14 describes practical features and applications. Illustrations show a variety of Profilometer combinations for measuring the surface finish of almost any production surface. Pictures normal range of roughness readings and discusses what happens to surface when cutting tool begins to get dull.

10 ULTRASONIC THICKNESS TESTERS—*Branson Instruments Inc, 40 Brown House Rd, Stamford, Conn.* 8-page bulletin A-200 gives details on lightweight Audigage Models 5 and 6 that permit measurement of thickness from only one side of a wide variety of materials—metal, glass, plastic—by relating a variation in thickness to the change in resonant frequency. Includes specifications and applications.

11 ELEVATING FEEDERS — *Detroit Power Screwdriver Co, 2501 W Fort St, Detroit 16, Mich.* 4-page folder 2812 provides information on complete line for automatic feeding and orienting of parts manufactured from most materials in practically any shape. Construction and dimensional data included on three standard size units of 6, 12, and 20 cu-ft holding capacity.

12 POLISHING WHEELS — *Nu-Matic Grinders Inc, 375 E 140th St, Cleveland 10, Ohio.* Literature describes expanded line of inflated and expanding polishing wheels as well as sanding drums, belt sanders, and expanding cones.

13 VISES—*Chicago Tool & Engineering Co, 3333 S Chicago Ave, Chicago 17, Ill.* 18-page pocket-size catalog P100 has information on more than 70 items including Palmgren drillpress vises, angle vises, milling machine vises, production and air vises, adjustable angle plates, cross-slide milling tables, rotary and indexing tables, and lathe milling attachments.

14 ROUND CHART RECORDER-CONTROLLER — *General Electric Co, Schenectady 5, NY.* 4-page bulletin GEZ-2969 describes features, application, measureable parameters, and specifications for GE's new line of single and double-pen recorders, null-balance, potentiometric-type units that complement the line of strip-chart recorders. Includes dimensions and a list of available charts and scales.

15 PENTA PRISM BEHAVIOR—*Engis Equipment Co, 431 S Dearborn St, Chicago 5, Ill.* 20-page booklet describes the effects of changes in Penta Prism (or optical square) position and alignment in

optical tooling techniques. Illustrates behavior of the prism in its varying applications and provides data for designers and engineers employing modern techniques.

16 TACHOMETERS—*Madison Electric Products Inc, Madison, Ohio.* 4-page bulletin contains description of nine tachometer indicators and six electric generators for tachometer service. Includes information covering the use of this type of equipment in connection with variable speed applications and tells how these instruments can be installed at the point of machine operation or at remote control stations.

17 VIBRATORY FEEDERS — *Syntron Co, 311 Lexington Ave, Homer City, Pa.* 32-page illustrated catalog contains descriptions, data, and specifications on line of small, heavy, and extra heavy-duty standard electromagnetically vibrated units for a wide range of applications.

18 FORCE RING TRANSDUCER — *Morehouse Machine Co, 1742 Sixth Ave, York, Pa.* 4-page bulletin 173 describes in detail the proving ring and differential transformer, components which make up the force ring transducer. Specifications covering both components are included and performance curves point up the accuracy of the proving ring.

19 PUSH-PULL TESTER — *Testing Machines Inc, 73 Jericho Turnpike, Mineola, LI, NY.* Data sheet illustrates and describes new light universal tester and LST test stand. Stand can be used with any one of five different capacity push-pull gages ranging from 0.01 to 25 lb with an accuracy of ½ of 1 graduation for testing compression or tension.

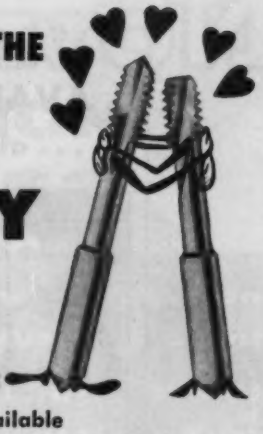
20 SAFETY TOOLS — *Ampco Metal Inc, Box 2004, Milwaukee 1, Wis.* 24-page illustrated catalog covers wide range of non-sparking tools that are also non-corrosive and non-magnetic. New additions to line include two sizes of channelock pliers, a small adjustable end wrench, several styles of air hammer chisels, and 18 sizes of Allen wrenches.

HEAT TREATING AND WELDING

21 HAND TORCHES—*Air Reduction Sales Co, 150 E 42 St, New York 17, NY.* 36-page catalog (Form ADC 702E) on line of gas welding and cutting torches, outfits, tips and accessories, includes general descriptions, features, specifications and photos. This revised edition contains data on many new products and improvements including the general purpose welding torch with stainless steel

"The boss was dead set against our having a suggestion box in the first place!"

THE INSIDE STORY BEHIND THE "NECKING" OF THE NEW JARVIS STUBBY



NEW STUB SCREW MACHINE TAPS FOR BAR AUTOMATICS SAVE TIME, ELIMINATE ALTERATIONS!

HIGH SPEED STEEL — GROUND THREADS

Three Styles Available

Spiral Flute Bottoming #SF-01	Spiral Point Plug #SP-50	Spiral Point Bottoming #SP-70

WHY STUBBY?

Jarvis Stubby, a new screw machine stub tap developed for production tapping on bar automatics, is designed to cut costs by eliminating down time and improving performance.

SECRET OF STUBBY'S "NECKING"

The area directly behind Stubby's threads has been necked down to below the root diameter. This "necking" creates *more chip room . . . reduces drag . . . facilitates application of cutting oils or coolants* to the cutting edges for *longer tap life.*

STUBBY IS STRONGER

Its *short threaded section* and *shorter overall length* make Stubby a much *stronger* tap. You use standard size bushings (eliminating the need for special drills when making tap holders), because Stubby's shank is ground to standard fractional dimensions. Depth of thread is not a problem; for the combination of length of thread and length of necked shank is equal to the thread length on equivalent standard taps.

STUBBY BEATS COSTS — CUTS DOWN TIME

With Stubby you no longer need to alter standard taps for short clearance jobs. This means you cut costly machine down time, operator's time and minimize the possibility of having inconsistent tap performance.

STUBBY AVAILABLE FROM STOCK!

Stubby *is available from stock* in Spiral Flute Bottoming #SF-01, Spiral Point Plug #SP-50, and Bottoming Spiral Point #SP-70. All 3 styles available in machine screw sizes #2 thru #10. Other sizes available on request. WRITE FOR STUBBY LITERATURE AND TAP CATALOG.

OTHER JARVIS TAPS AVAILABLE:

- HAND TAPS
- MACHINE SCREW TAPS
- PIPE TAPS
- NUT TAPS
- TAPPER TAPS
- PULLEY TAPS
- ALL TYPES OF SPECIALS

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...all manufactured to American Standard dimensions

- **Save time and tool costs**
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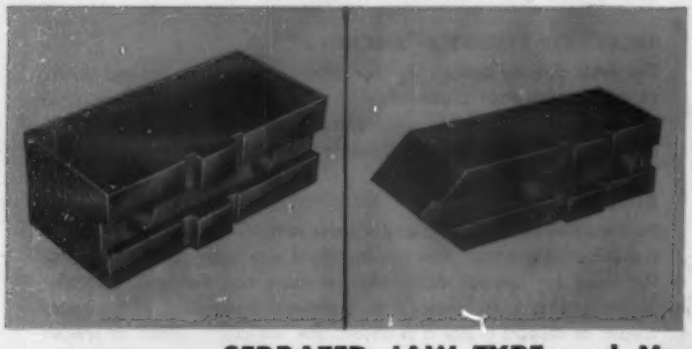
- **Cost *less to buy* than to make yourself**

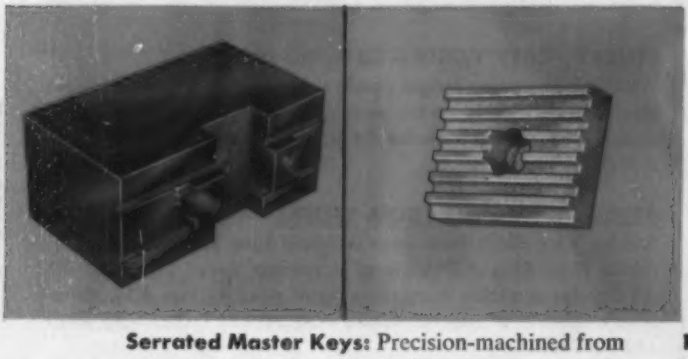
Now you can save time, money and delays by selecting from Skinner's complete line of Soft Blank Top Jaws for *all* chucks made to American Standard dimensions. Take advantage of fast, one-source service at your nearest distributor. His stocks are complete in all sizes and shapes. Call him today!

TONGUE AND GROOVE TYPE



MEDIUM DUTY—For Self-Centering Scroll Chucks, Independent Chucks and Combination Scroll Chucks.
HEAVY DUTY—For Power, Independent and Self-Centering Scroll Chucks.
These jaws can be used as supplied or shaped to meet specific requirements. Made from low carbon steel which can be easily carburized and hardened. Extra-high heavy duty top jaws are also available. The Long Pointed Jaws are designed so that points meet at center of work, permitting full use of chuck capacity.

SERRATED JAW TYPE and Master Keys



For Heavy Duty Power and Scroll Chucks
These jaws also can be used as supplied or shaped to meet specific requirements. They are processed to resist rust and can be easily shaped, carburized and hardened. Screw is supplied when jaw and corresponding key are purchased together—permitting key and jaw to be stored assembled as a matched set.

Serrated Master Keys: Precision-machined from top quality, hardened steel. Serrations are so machined that by reversing master key 180°, the top jaw can be adjusted to ½ the pitch of the serrations. This feature permits easy adjustment of the top jaws in reference to the work.

HEAT TREATING INSTRUCTIONS INCLUDED WITH ALL BLANK JAWS

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head and fixed flow valves, and Bernz-O-Matic kits for utility flame heating applications.

22 INDUCTION HEATING EQUIPMENT—*Ajax Magnethermic Corp, PO Box 839, 3990 Simon Rd, Youngstown 1, Ohio.* 8-page booklet illustrates and describes different types of equipment and applications; billet heating for extrusion or forging; heat treating, annealing, and hardening; joining, brazing, or soldering; melting, vacuum, or air melting; and sintering. Data includes selection chart for billet heaters, melting rates in pounds per hour; table of frequencies; and individual product specifications.

23 INDUCTION HEATING EQUIPMENT—*Robotron Corp, 21300 W Eight Mile Rd, Detroit 19, Mich.* 4-page folder on equipment for automated metal heating illustrates and describes some of the company's standard units including motor generator sets, control stations and fixed-installation as well as portable heating stations. Also discusses company technical services available to the customer including problem analysis, research, design engineering, and manufacture of tailor-made end product.

24 GLOBAR TUBULAR ELEMENT FURNACES—*Harper Electric Furnace Corp, 110 Pearl St, Buffalo 2, NY.* Bulletin GT-1059 gives data on recently modernized line for processing a wide variety of work at temperatures up to 3000 F. Describes operating and control features; includes illustrations of air and controlled atmosphere models as well as dimension drawings and specifications.

25 WELDING DATA FOR DUAL SHIELD — *National Cylinder Gas Division, Chemetron Corp, 840 N Michigan Ave, Chicago 11, Ill.* Brochure NH-636 contains operating information for the Dual Shield carbon dioxide welding process. Gives automatic welding data for butt weld, horizontal and positioned filled, and V-groove flat joints on mild steel, and data for mild steel spot welding.

PLANT SERVICE EQUIPMENT

26 DUST COLLECTORS — *American Standard Industrial Division, Detroit 32, Mich.* 16-page bulletin 1828 covers line of Series 342. Guides are included for proper selection and for determination of anticipated collector efficiency. Assembly

"We've been running this machine constantly for 37 years and this morning for no reason at all it quits cold!"

PRECISION PRODUCTION PROBLEMS?

Here's help from Bausch & Lomb in TOOL DESIGN INSPECTION FABRICATION MEASURING TESTING

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Quickly measures transparent or opaque objects of any contour. Linear, accurate to 0.0001"; angular, to 1 minute of arc.

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Positions small parts for critical measurement with B&L Bench Comparator and Toolmakers' Microscope. Auxiliary base, with 7" travel, increases range beyond that of measuring stage.

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Time-and-money-saving data on Surface Comparators, Industrial Magnifiers, Macroscopes, Micrometer Discs, Brinell Microscopes, Microscope Bodies, Wide Field Tubes, Shop Microscopes.

NEW SCRATCH-DEPTH GAGE

With this simple hand-held instrument you can measure the depth of any scratch to 0.0001"; with a range of 0" to 0.015"

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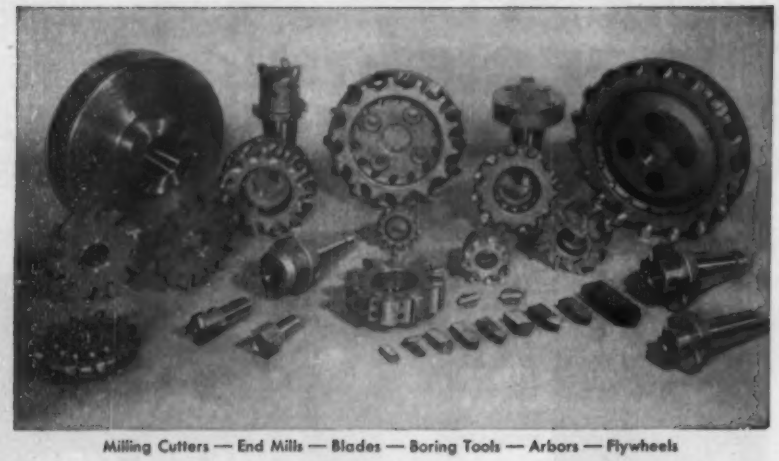

Milling Cutters — End Mills — Blades — Boring Tools — Arbors — Flywheels

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If you are not now using Lovejoy products, we invite you to do so at first opportunity.

Lovejoy precision-engineered tools include:

Inserted-tooth milling cutters (face, side, end, slotting and boring) which feature husky, forged steel housings; exclusive Lovejoy "positive-locking" blade assembly; a variety of dozens of models and hundreds of sizes.

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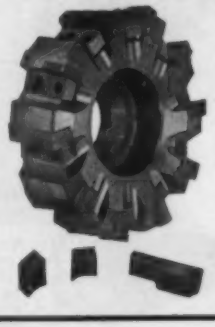
This performance-proved face mill features indexable blades for low cost-per-edge cutting. Exclusive design improvements include — adjustable anvils • extra deep chip flutes • fast, easy indexing • sweep blades for fine finish • double positive, or combination positive and negative rake angles merely by changing blades • rugged, one-piece body • large locking screws. *Try out a new "Joydex" and prove its superiority! ("Joydex" data sheet is yours for the asking).*



Catalogs — include: "Face Mill Catalog No. 31; Side Mill Catalog No. 32; Type "S" Bulletin; Arbor Catalog No. 33; "Speed and Feed" Calculator. Write today for copies desired.

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Springfield, Vermont, U.S.A.

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arrangements illustrated; table provides necessary dimensional and physical data for determination of installation requirements.

27 STEEL FINISHING—*Lea Manufacturing Co, 16 Cherry Ave, Waterbury 20, Conn.* Data sheet contains detailed recommendations for producing selected finishes on carbon and stainless steels. Finishes described are Satin, Butler, and Bright. Covers abrasive compound recommendations, wheel speeds, types of buffs.

28 BARREL FINISHING — *Tumb-L-Matic, 39 S Mary's St, Stamford, Conn.* Technical process bulletins include TPB-2 on the Quicklustre 104 Wax Process; TPB-3 which covers the DL Process for achieving color, lustre, and texture directly comparable to that achieved by hand buffing; and TPB-5 that offers information on the preparation of resistor leads prior to tin electroplating and hot dipping.

29 GOLD PLATING PROCESS — *Sel Rex Corp, Nutley, NJ.* 6-page technical paper AG-12 give metallurgical properties, operational data, and uses of a patented acid-type industrial gold electroplating formulation trade-named Austronex. Deposit characteristics, corrosion resistance, equipment requirements, solution makeup and maintenance, gold consumption, metal content chart included.

30 LIQUID CLEANER—*Kelite Corp, 81 Industrial Rd, Berkeley Heights, NJ.* Bulletin P-12591 provides information on Kelite Formula 28 for removing grease, oil, ink, soot, dirt, light carbon, and similar deposits from hard surfaces without heat, fumes, or fire hazard. It can be used at room temperature by spray, wipe-on, or immersion method on commonly used metals, plastics, Plexiglas, rubber, porcelain, wood, and painted surfaces.

31 AIR-COOLED CONDENSERS — *Halstead & Mitchell, Bessemer Bldg, Pittsburgh 22, Pa.* 12-page bulletin AC-102 discusses four types of units in detail: those using propeller fans for horizontal air flow, propeller fans for vertical air flow, centrifugal fans for use with ductwork, and centrifugal fans for residential air conditioning. Construction features and specifications included.

32 SLURRY PUMP—*Milton Roy Co, 1300 E Mermaid Lane, Philadelphia 18, Pa.* 4-page illustrated bulletin 1158 describes the Oliver Diaphragm unit capable of metering slurries with up to 60% solids at a controlled volume accuracy of ±2.0%. Flow volume can be varied from 0 to 180 gph at pressures to 90 psi by remote control electric timer or electrical probe mechanism.

33 STORAGE RACKS—*Met-Fab Inc, PO Box 417, Williamsport, Pa.* 4-page illustrated bulletin provides information on dual-angle, adjustable racks made of high carbon rail steel. Several standard sizes are available with a positive-locking feature for fast assembly and adjustability.

34 ELECTRICAL CONTROL, DISTRIBUTION, AND POWER EQUIPMENT — *Federal Pacific Electric Co, 50 Paris St, Newark 1, NJ.* 155-page Redi-Reference condensed catalog describes some 2500 products including 30 general types. Tables of specifications, pricing information, and wiring diagrams; engineering data on full load motor currents, and selection tables for switches, circuit breaker, fuse and wire sizes for motor branch circuits.

PARTS AND MATERIALS

35 LEDLOY STEELS—*Joseph T Ryerson & Son Inc, Box 8000-A, Chicago 80, Ill.* 8-page technical bulletin 12-10 gives engineering data on Ledloy 375 and 300 cold finished steel bars and Ledloy 170 cold drawn steel tubing, said to be the fastest machining bar and tubular steels available anywhere. Cost and cutting speed comparisons, mechanical properties, chemical compositions, case histories, and data on tubing vs bar stock included.

36 CHAIN AND SPROCKETS—*Dodge Manufacturing Corp, Mishawaka, Ind.* 56-page bulletin A691 gives details on extensive line of roller chain and Taper-Lock sprockets. Photos and diagrams show construction details and advantages; data provided on Taper-Lock chain couplings. Includes general information on installation of roller chain drives, calculation of center distances, hp ratings, conveyor engineering, and instructions for lubrication and maintenance.

● "MAGNETOSTRICTION IN COBALT AND COBALT ALLOYS"—*Cobalt Information Center, c/o Battelle Memorial Institute, 505 King Ave, Columbus 1, Ohio.* 60-page compilation outlines the reciprocal and non-reciprocal mechanical and magnetic effects on ferromagnetic materials produced by magnetization. More than 125 references to magnetostriction effects in cobalt and cobalt alloys are listed, covering technical literature from 1874 through mid-1959. References are accompanied by abstracts and tables. Request direct on company letterhead.

37 SOCKET HEAD CAP SCREWS — *Holo-Krome Screw Corp, Hartford 10, Conn.* 5-page Form CSN is complete engineering technical standard covering 1960 Series of forged socket head cap screws. Important changes printed in color in table of dimensions.

● ZIRCONIUM—*Zirconium Association, 2130 Keith Bldg, Cleveland 15, Ohio.* Fact File contains technical data, application, and available forms. Request direct on company letterhead.

38 MATERIALS FOR ADVANCED TECHNOLOGY—*Carborundum Co, Niagara Falls, NY.* 8-page technical data folder describes 26 new products from the R&D Division. Products which represent significant advances in materials resistant to abrasion, chemicals, corrosion, high temperatures, and nuclear radiation include new forms of silicon carbide, Fiberfrax ceramic fiber, boron nitride and boron carbide, zirconium and hafnium, Kovar iron-nickel-cobalt alloy, Stupalox hot-pressed aluminum oxide.

39 FASTENERS—*Huck Manufacturing Co, 2480 Bellevue Ave, Detroit 7, Mich.* 24-page illustrated catalog describes complete line. Driving cycles, strength

"I've got some bad news for you, Glotz—but I won't tell you till after you've eaten—"

To get the most out of barrel finishing

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS

Barrel finishing cuts unit-cost of deburring from 15¢ to 1¢! How much could it save you?

In one midwest plant, total cost of deburring 20,000 complex aircraft parts by barrel method came to less than $200. This compares with a former cost of $3,000 by hand methods.

This startling reduction in cost is the result of handling hundreds of pieces at a time, instead of grinding each one separately . . . and the result, too, of using the right compound to help the media and barrel do their work.

It's in selecting and supplying the right compound that Oakite helps you get the most out of barrel finishing. Oakite compounds include alkaline and acidic types . . . for steel, brass, zinc die castings, aluminum or alloy parts.

Ask your local Oakite man about barrel finishing, or write for free booklet on barrel finishing to Oakite Products, Inc., 28A Rector Street, New York 6, N. Y.

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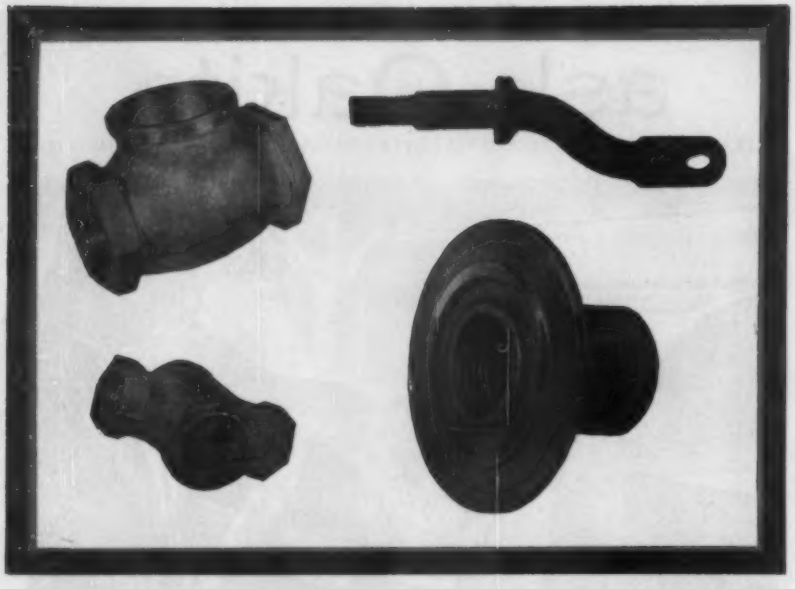
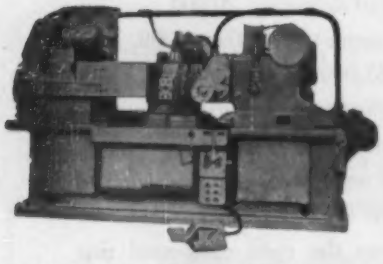
OAKITE
over 50 Est. 1909 SCIENCE
years' leadership in industrial cleaning



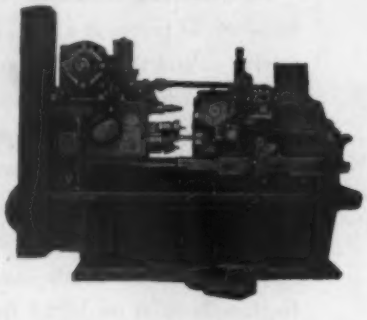
PARTS LIKE THESE and MANY OTHERS ARE BEING PRODUCED

with speed, convenience and economy . . .

on GOSS & DeLEEUW AUTOMATIC CHUCKERS



THE "ONE-TWO-THREE" 7-SPINDLE TOOL ROTATING CHUCKING MACHINE can complete in one operation as many as three ends of valve bodies, plumbing fittings, etc. eliminating secondary operations.



4-SPINDLE TOOL ROTATING CHUCKING MACHINES available in three sizes, combine various turning, boring, facing, threading, multiple drilling and tapping operations on a wide range of single-ended parts.

Send samples of your work for time estimates. Ask for illustrated literature.

GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

data, typical applications, grip ranges, dimensional data, hole size recommendations, and installation notes included for each of the products.

40 MECHANICAL BREADBOARD COMPONENTS—*PIC Design Corp, 477 Atlantic Ave, East Rockaway, LI, NY.* 25-page technical booklet 4 contains design tips and recommendations for instrument engineers and designers. Do's and don'ts of mechanical assembly included.

41 PACKINGS—*Greene, Tweed & Co, North Wales, Pa.* 8-page catalog FF-1059 offers information on 14 types of Palmetto fabric, foil, plastic, and filament packings available in nine constructions which are illustrated. General data lists details on composition, application, service information, temperature limits (up to 1200 F) for each type, plus tables of sizes.

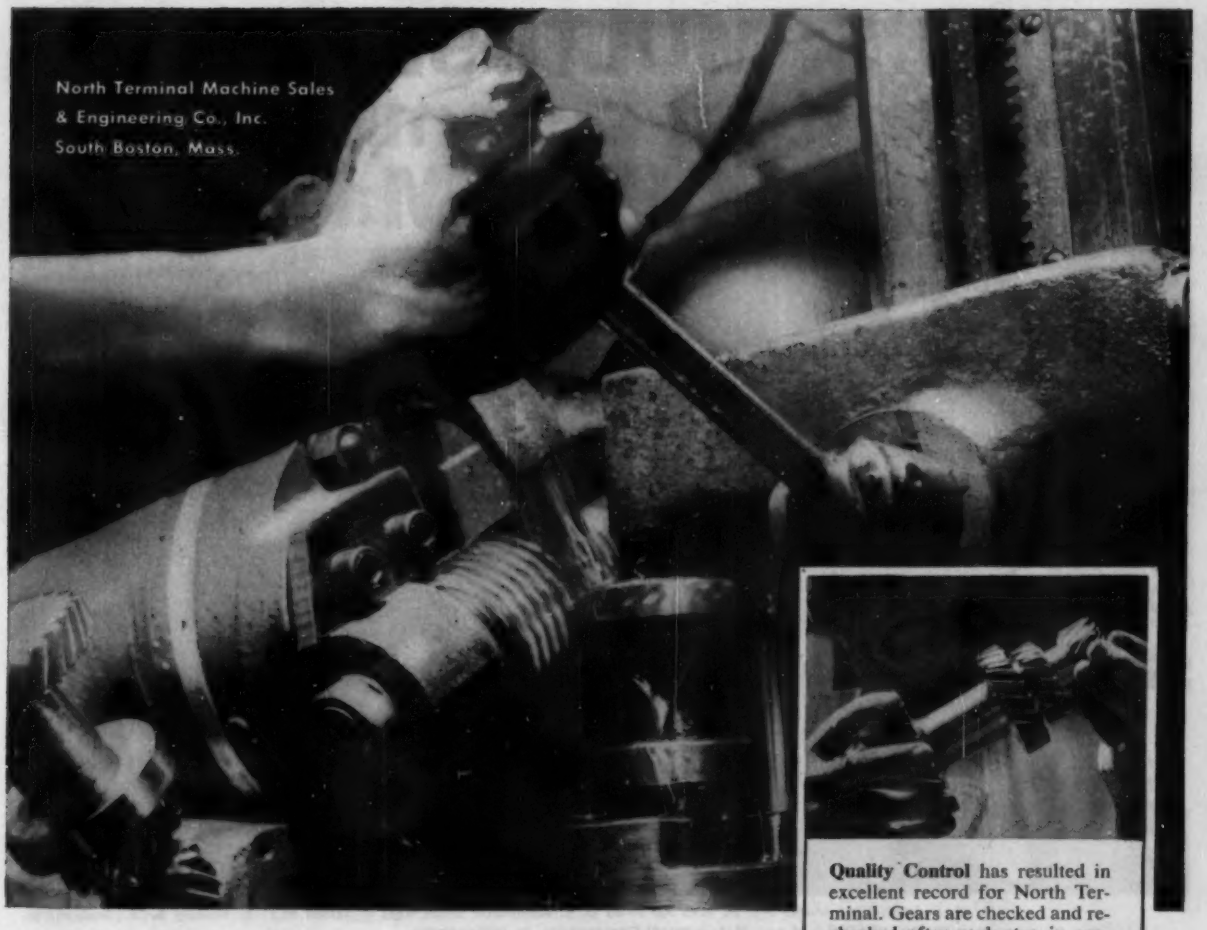
42 SWITCHES—*Newark Controls Co, 15 Ward St, Bloomfield, NJ.* Four technical data sheets describe and illustrate two absolute air pressure switches and two gas density switches for use as control and warning devices to monitor pressures or densities of gas or vapors either in sealed containers or in open systems. Typical applications, dimension drawings, specifications and characteristics included for each.

43 EXPLOSION-PROOF HOUSINGS —*Adalet Manufacturing Co, 14300 Lorain Ave, Cleveland 11, Ohio.* 16-page catalog 160 illustrates and describes complete line of cast-aluminum housings that are rust and spark-proof, and non-magnetic. Dimension charts and applications included.

44 EXTRUDED ALUMINUM BRONZE —*Meier Brass & Aluminum Co, 1471 E Nine Mile, Hazel Park, Mich.* 6-page brochure gives information on Wear-ite manufactured in extruded rectangles for use as wear strips, wear plates, and similar applications where the toughest of aluminum bronzes is required. Describes characteristics of material, covers sizes, weight, applications, chemical and mechanical composition.

45 AIRCRAFT BOLTS — *Standard Pressed Steel Co, Box 875, Jenkintown, Pa.* 4-page illustrated bulletin (Form 2531) covers new line of high-strength bolts which provide 220,000 psi minimum tensile strength yet weigh no more than regular NAS 624 Series bolts of 180,000 psi. This LWB 22 Series permit fastener weight reductions of as much as 50%.

"How happy can your company make me?"



Quality Control has resulted in excellent record for North Terminal. Gears are checked and rechecked after each step in production. Quality lubricants have helped hold to close tolerances.

Hob Life Increased 250% with Cities Service Chillo 10 Cutting Oil

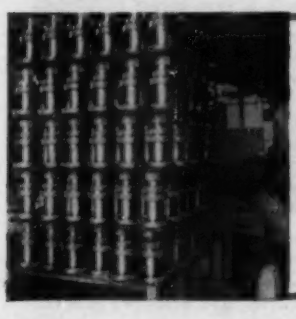
North Terminal makes replacement gears for automobile transmissions. In a day's time the firm—which makes the gears from raw stock to finished product—completes up to 5600 gears. Producing in quantities like this, hob life is an important consideration in *cost* of production as well as *quality* of production.

Previous cutting oils were tested on the gear hobbing machines and they resulted in hobs producing as low as 87 gears before replacement. Cities Service Chillo 10 cutting oil under the same conditions resulted in over 200 gears with a superior finish before a hob replacement was necessary.

Edward W. Malley Jr., President of North Terminal, states, "We didn't choose Cities Service cutting oil blindly. Many competitive oils were tested before we were satisfied that Chillo 10 was superior in every way."

Even if you're satisfied with your present cutting oil, a test of Cities Service Chillo 10 may give you a very pleasant surprise. Test after test under actual manufacturing conditions has shown Chillo 10 to give longer tool life and superior finishes.

Arrange for your own test by calling your nearest Cities Service office or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, New York.

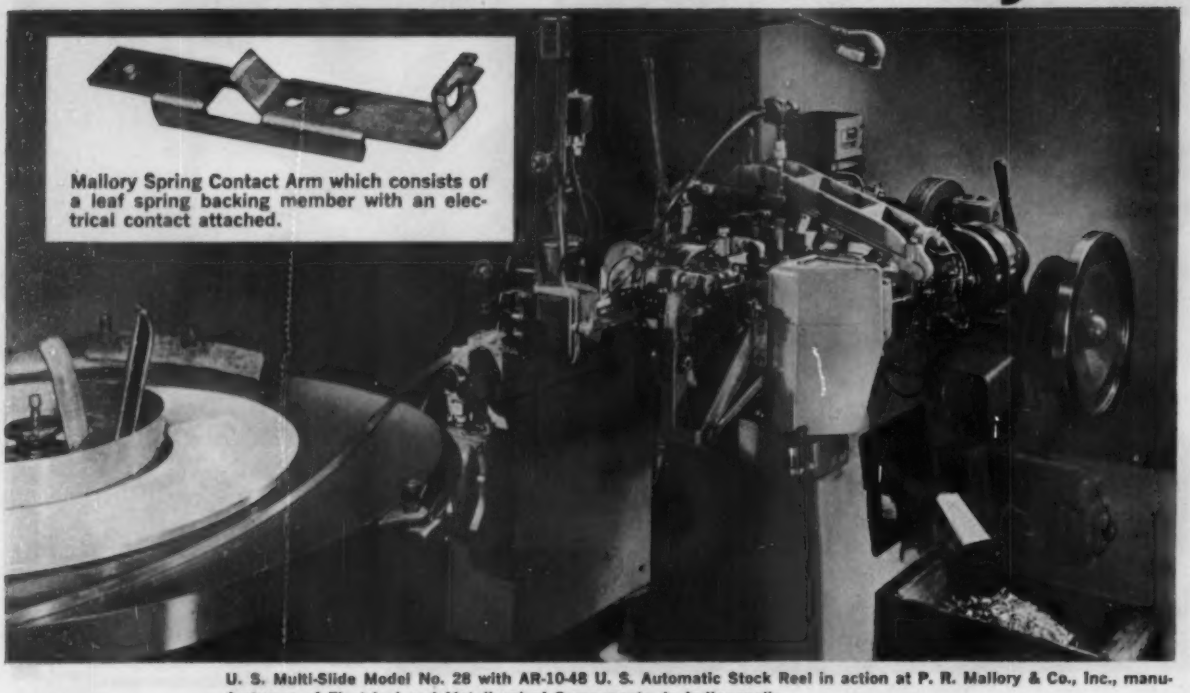


5600 Gears per day or the equivalent of 800 replaced transmissions are produced every day by North Terminal. Gears are made for all makes of cars with a good portion of production being shipped overseas.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

U.S. MULTI-SLIDE® cuts contact assembly costs 20% at P. R. Mallory



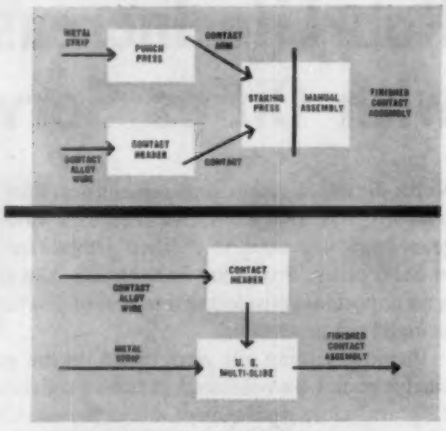
Mallory Spring Contact Arm which consists of a leaf spring backing member with an electrical contact attached.

U. S. Multi-Slide Model No. 28 with AR-10-48 U. S. Automatic Stock Reel in action at P. R. Mallory & Co., Inc., manufacturers of Electrical and Metallurgical Components, in Indianapolis.

By the use of a U. S. Multi-Slide Model No. 28, P. R. Mallory and Co., Inc. — specialists in complete contact service — entirely eliminated one costly operation in the fabrication and assembly of Spring Contact Arms.

Today, these Contact Arms are formed and assembled on a U. S. Multi-Slide. Coil stock for the Contact Arms is fed from a Model AR-10-48 U. S. Automatic Stock Reel. This Multi-Slide pierces, trims, forms and cuts off the spring arms and attaches the prefabricated, hopper fed contacts in one continuous, automatic operation.

In volume production, complete contact assemblies now cost **$3.19 per thousand less** — a savings of 20%. And, according to Mallory, this automatic U. S. Multi-Slide production also improved product quality and reduced waste.



This shows how a U. S. Multi-Slide eliminated a separate staking press operation. This operation (now eliminated) required manual loading which was slow and costly.

Find out for yourself how U. S. Multi-Slides can cut costs, reduce waste and improve the quality of your products —

Write for U. S. Tool Company Bulletin No. 15A.

MMT PE

MULTI-SLIDE

U.S. TOOL COMPANY, INC.

AMPERE (East Orange) NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

Waterbury Farrel Foundry & Machine Co, Waterbury, Conn, has appointed **Arthur S Nippes** a vice president. He was previously consultant to the president of Simonds Saw & Steel Co and vice president and general manager of H K Porter Co's Disston Division

Buhr Machine Tool Co, Ann Arbor, Mich, has named **William Bournias** chief engineer. He was formerly project engineer on special multiple operation machine tools.

Louis F Polk Sr

NAMES IN THE NEWS...

Lake Erie Machinery Corp, Buffalo manufacturer of heavy hydraulic presses and diecasting machinery, has appointed **Robert A MacLean** western district manager with headquarters in Los Angeles. **Theodore L Theodorff** has been named manager of the Detroit district office.

General Motors has appointed **Algie A Hendrix** manager of the **AC Spark Plug Division** operation in Milwaukee. Formerly assistant manager, he succeeds **Leo W Tobin Jr** who has been transferred to GE's new Defense Systems Division in Detroit.

Chrysler Corp has appointed **A P Podges** director of quality control for the Car and Truck Assembly group. He was formerly production manager of the Imperial Assembly plant.

Aeronca Manufacturing Corp, Middletown, Ohio, aircraft component manufacturer has named **W W Rutledge** a vice president of the company. Mr Rutledge recently resigned as manufacturing manager of the Wichita Division of Boeing Airplane Co to accept his new post at Aeronca.

"Mr Fred" Van Norman (center), one of the founders of the **Van Norman Machine Co** (1885) and chairman of the board of the Springfield, Mass, firm until his formal retirement in 1955, receives congratulations on his 97th birthday from **Paul W Leming**, president (left), and **Selby F Greer**, executive vice president

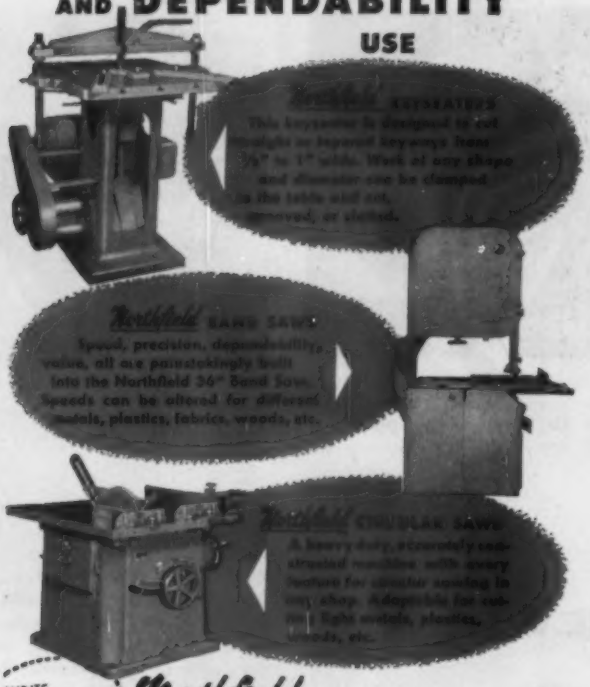
Louis F Polk Sr, president of **Sheffield Corp and** director and vice president of **Bendix Aviation Corp**, is presently on indefinite leave of absence because of compelling personal family reasons. He is acting in a consulting capacity and retains his membership on the Bendix board and his officerships including the presidency of Sheffield. Mr Polk intends to resume his activities later in the year although retaining more flexibility in daily schedule. **C Thorpe Thompson**, vice president and general manager of Sheffield, heads a management committee that is handling many of Mr Polk's duties during his absence.

Bickley Furnaces Inc, Philadelphia, has elected **Charles A McFadden** vice president. Mr McFadden, formerly divisional manager of Selas Corp, joined Bickley last September to assist in development and marketing of high temperature furnace equipment.

General Electric Co has appointed **James R Olin** manager of manufacturing for the Small AC Motor and Generator Department in Schenectady, NY. He has been superintendent of motor and generator manufacturing for the department since 1954. **Dr Walter R Hibbard Jr** has been named manager of the Metallurgy and Ceramics Research Department. He has been serving as manager of the alloy studies section of the Department.

Worthington Corp, Harrison, NJ, has elected **A William Fraser** vice president and general sales manager. He was previously general marketing manager.

FOR EFFICIENCY AND DEPENDABILITY USE



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NORTHFIELD, MINNESOTA, U. S. A.

CIRCLE 292 READER SERVICE CARD

O K END MILL WITH V5A SUPER HIGH SPEED STEEL BLADES

carbide—not for every job...

The low transverse rupture strength of carbide creates problems, especially on jobs involving intermittent milling. You will need sound tool geometry, firmness for machine, fixture and workpiece. We recommend blades of V5A super high speed steel. Write for data sheets. THE O K TOOL COMPANY, INC., 400 Elm Street, Milford, New Hampshire.

OK modern milling cutters for modern milling machines

NAMES IN THE NEWS...

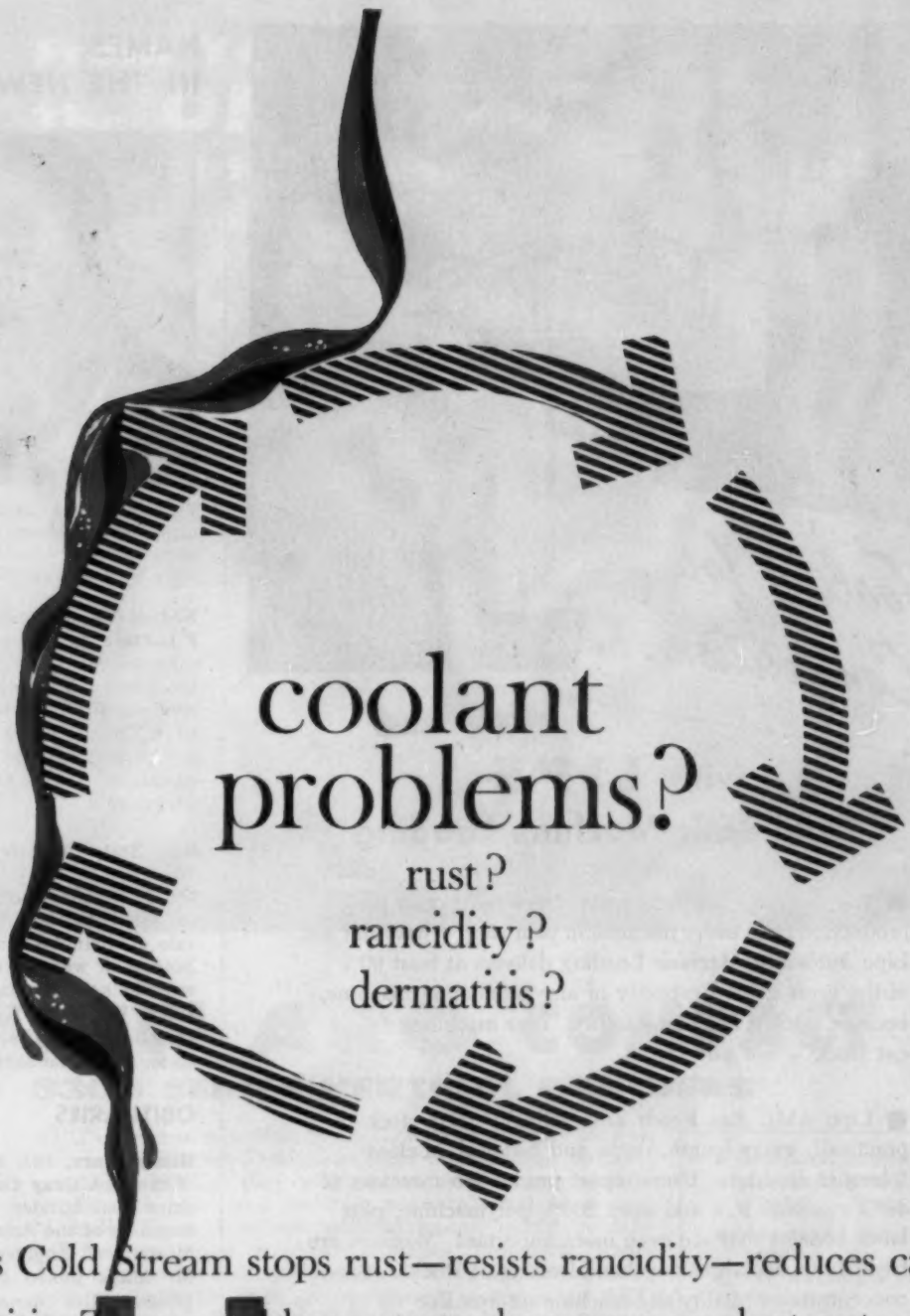
F Jos Lamb Co, Detroit, has appointed **Orval A Opperthauser** chief engineer. He moves up from the post of assistant chief engineer

Pratt & Whitney Co, West Hartford, Conn, has appointed **George W Steinmetz** manager of industrial distribution. He was previously sales manager for W H Nicholson & Co

American Machine & Foundry Co, Lancaster, Pa, has appointed **A E Richardson Jr** general sales manager of the **DeWalt Division.** He was formerly general sales manager of DeWalt Canada Ltd, Canadian subsidiary.

Dumore Co, Racine, Wis, has appointed **Harry L Wardrip** vice president, sales. Formerly sales manager, he succeeds **Tom Carroll** who was recently named executive vice president of Master Manufacturing Co, Hutchinson, Kans, subsidiary.

Planet Corp, Lansing, Mich, manufacturer of custom engineered materials handling systems and automation equipment, has promoted **Joseph Brown** from assistant to chief engineer. **Daniel Smith,** senior design engineer, has been named production manager.



Johnson's Cold Stream stops rust—resists rancidity—reduces causes of dermatitis. These problems start when your coolant gets dirty. Cold Stream stays clean week after week—even on cast iron. Cold Stream gives longest tool life. Finest finishes. Highest speeds and feeds. Best dimensional control. Cold Stream gives you all the performance you pay for. **JOHNSON'S WAX**

cold stream

For information, see your local Johnson industrial distributor.

"Cold Stream" and "Johnson's" are trademarks of S. C. Johnson & Son, Inc., Racine, Wis.

with **LIPE**

Automatic Machine Loading

● You can meet and beat competition by getting peak production from every machine in your shop – new *and* old. Lipe Automatic Machine Loading delivers at least 90% of the gross geared capacity of any production machine, because stock is fed continuously. Your machines cut stock – not air!

● Lipe AML Bar Feeds automatically feed stock of practically every length, shape and material, in close-tolerance feedouts. Users report production increases of 40% . . . 90% . . . and even 200% per machine, plus labor benefits that are even more important. Workers are freed from back-breaking hand-loading of stock . . . concentrate on quality and machine set-ups. For a free estimate of what Lipe AML can do for your shop, send prints or samples of typical work. Write for full information.

Stop Cutting Air and You Start Cutting Costs

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N.Y.

PIONEERS IN PNEUMATIC BAR-FEEDING

NAMES IN THE NEWS . . .

Rollway Bearing Co, Syracuse, NY, has named **Otto J Manse** manager of manufacturing. He was formerly associated with Westinghouse Electric Corp

Norton Co has named **Dr Wilfred F L Place** vice president and general manager of Norton International Inc, Norton's foreign division. He succeeds **Frank M Ryan** who has retired. Dr Place has been serving as a vice president of Norton International in charge of Behr-Manning products.

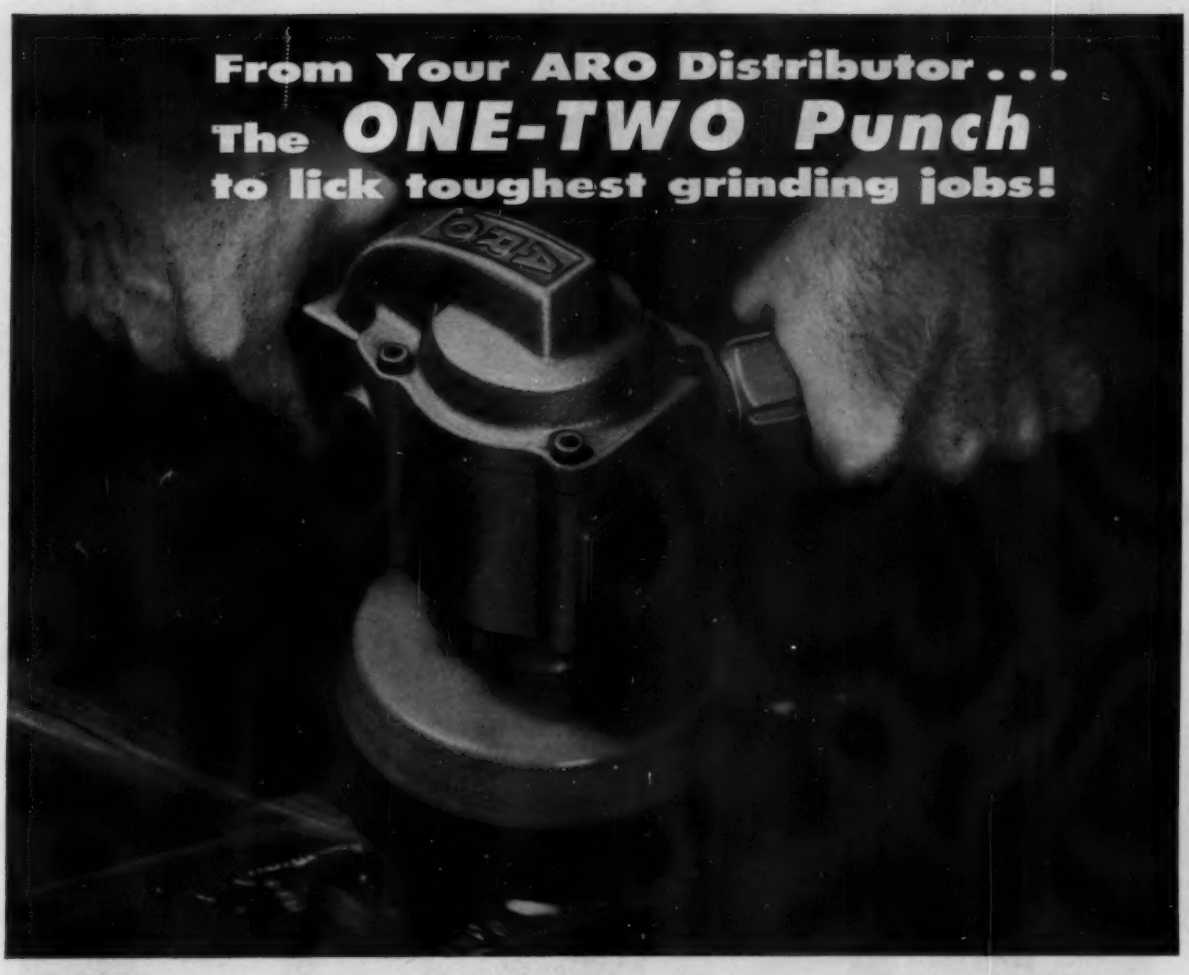
Bay State Abrasive Products Co, Westboro, Mass, has appointed **Lester F Kuzmick** and **Fred K Ryan** to serve in the manufacture and sale of diamond wheels and blades. Both men were formerly associated with Felker Manufacturing Co, Torrance, Calif; Mr Kuzmick was vice president, manufacturing and Mr Ryan sales manager.

OBITUARIES

Henry Marx, 101, former president of the **G A Gray Co,** Cincinnati machine tool builder, and one of the founders of the American Society of Mechanical Engineers, died Feb 8. Mr Marx joined Gray in 1889 as general sales manager. In 1905 he became president of the company and filled the post until 1952 when he was made board chairman He retired as chairman last year.

Raymond A Cole, 66, executive vice president and general manager of Production Machine Co, Greenfield, Mass, manufacturer of polishing machinery, died Feb 10.

Frank A Stanley, author of *Punches and Dies,* co-author of *American Machinist's Handbook,* and a senior associate editor of AMERICAN MACHINIST many years ago, died Jan 27.

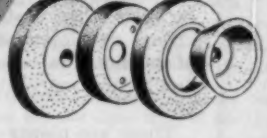


1 NEW ARO COMPACT
8300 SERIES VERTICAL GRINDERS

ARO's powerful new 8300 Series Grinders are plenty long on muscle and hustle . . . to make short work of your toughest grinding jobs. Yet they weigh in at only seven pounds—handle with ease—and maintain accurate speed from start to finish. Features include unitized motor, safety throttle, and low-level noise. Solid ARO quality throughout. Team ARO 8300's with quality abrasives to cut your grinding costs. Both are available from one convenient source—your ARO Distributor. Ask him about job-testing an ARO 8300 soon!

- Compact, powerful.
- 4500, 6000, 8000 r.p.m.
- Weigh only 7 lbs.
- Maintain accurate speed.
- Use with up to 6" wheels.

2 THE RIGHT ABRASIVE WHEELS



See your ARO Distributor for expert help in choosing the correct wheel for each grinding job. He has a complete selection of standard cup wheels, depressed-center wheels and sanding discs to give you peak efficiency with the new ARO 8300 grinders. Call him today!

THE ARO EQUIPMENT CORPORATION
Bryan, Ohio
Aro of California, 3141 S Grand Ave Los Angeles 7, Calif.
Aro Equipment of Canada Ltd., Rexdale (Toronto), Ontario
Offices in All Principal Cities

ARO®
AIR TOOLS
Also Air Hoists, Automation Tools

LET THIS KIT INTRODUCE YOU TO

New "POP" RIVETS

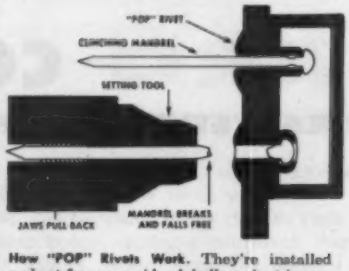
It Can SAVE Your Company Thousands of Dollars!

ONLY $19.95 PREPAID

Idea men seeking a better, quicker and less expensive way to fasten products will put this Kit to work now in design and methods engineering departments. It can prove what thousands of companies already know — that "POP" Rivets can save over 50% on installed rivet costs — improve quality, speed production.

This Kit helps you experiment with simplified product design, study vibration effects, clearances, or examine fastener appearance. Methods or production men can try assembly-line fixes on the spot. Time study analysts can make direct fastener comparisons.

Assembled as an inexpensive means of introducing you to the "POP" Rivet fastening system, this new Kit contains everything needed — instructions, rivet assortment, hand pliers for setting rivets, — plus idea information.



How "POP" Rivets Work. They're installed and set from one side. A hollow rivet is preassembled on a solid headed mandrel which is used to set the rivet. Mandrel head is larger than end of rivet. When the head is forced into the rivet with setting tool, the mandrel head clinches the rivet. Mandrel breaks near head under tension when rivet is set. Both hand and production power tools are available.

Order Your "POP" Rivet Idea Kit Now
Provide your firm with the advantages of a better blind riveting method. It can save thousands of dollars in installed fastening costs.

UNITED "POP" RIVETS

"POP" RIVET DIVISION
United Shoe Machinery Corporation
104 River Road, Shelton, Conn.

Attached find ☐ check ☐ purchase order
for ..... "POP" RIVET Kits No. 100 @ $19.95 prepaid.
NAME ..... TITLE .....
AFFILIATION .....
STREET .....
CITY ..... ZONE ..... STATE .....

NOTE: Kits will be shipped immediately from Shelton, Conn. or, wherever possible, from your local supplier.

NEW BOOKS...

CEMENTED CARBIDES — *By Dr Paul Schwarzkopf and Dr Richard Kieffer, in collaboration with Dr Werner Leszynski and Dr Fritz Benesovsky. Published by The Macmillan Company, 60 Fifth Ave, New York 11, 349 pages. Price $15.00*

It is a distinct pleasure to review a technical book that is also a literate effort; one on which the authors have taken the trouble to organize their material, consider balance of technical content against reporting and interpreting, and write in a style that is quite readable. Furthermore, the authors are authorities on the subject—Dr Schwarzkopf is the inventor of multi-carbide hard metals, and all have done research and worked on production methods for such modern-day materials as rare metals, powdered metals, and high-temperature materials.

With this background, it is a wonder that the book is not the usual esoteric treatise in high-blown language understandable only to students and scientists. The book is not dense, it is a display in proof of the theory that a man who truly understands his subject can express his ideas.

There are chemistry, physics, strength of materials, and other branches of mechanics covered in the book, but the language (English) is such that anyone sufficiently interested in the subject can skip here and there, retain completeness of thought, and get a good deal out of the text without dealing too completely with all the technicalities. This is a book that practically anyone can read, providing he isn't afraid of being exposed to a new idea or two.

The text starts with historical development of carbide materials, and shows how the first practical-use suggestion of a cemented carbide by H R Connell of General Electric Co in 1909 was slowly evolved through the years into the first commercial carbide tools, by G E and Firth Sterling in this country, in 1928.

Next subject is the production of carbides, then sintering, test, properties, development of oxides, use of carbides as wear materials, and finally use of carbides as cutting tools.

There are plenty of illustrations—photos, sketches, graphs, tables, and charts. Each chapter is finished up with a bibliography, and there are an author index and subject index.

... More Than 1200 ® Catalog Items

CIRCLE R Circular Metal Cutting Tools originate in this plant, one of the largest anywhere devoted exclusively to this specialty. Here we design and craft more than 1200 catalog items, together with special tools designed to order. Our extensive facilities — 45,000 square feet — allow for every refinement in production of fine tools, holding within very precise tolerances where required.

CATALOG ITEMS meet practically every need in the complete range of slitting saws for metal, copper, textile metallics, plastics, rubber, sandpaper, emery cloth, etc.; cut off saws, commutator slotting saws, jewelers' slotting saws; circular knives and rotary shear blades; Deep-Cut saws, Circaloy steel saws, HSS saws, solid and tipped tungsten carbide saws, combined drills and countersinks and center reamers.

SPECIAL TOOLS are developed on order to meet your individual needs, with Circle R efficiency and economy, for cutting and slitting operations on the widest variety of materials.

PERFECTIONIST HEAT TREATING is a Circle R "exclusive." We use the latest and best furnaces obtainable, with automatic controls. Much of the specialized equipment is our own design, developed to implement our innovations in heat treating technology.

PRECISE CONTROL standardizes our quality and governs cost through use, under constant supervision, of the finest gauging and other equipment. Surface finish variations are indicated in micro-inches by Profilometer. Magnaglo inspection rules out rejects before they reach costly finishing stages — for your production, virtually eliminates costly downtime due to cutting tool defects.

FACTORY CONSULTATION SERVICE has been developed through continuous research and experience since 1923, backs up the technical advice provided for you by our Circle R Representatives — specialists in metal cutting who are at your service in all key markets.

Consult these CIRCLE R *Specialists . . .*

BURBANK
Production Mach. Sales Inc.

CHICAGO
Donald Robertson & Co.

CLEVELAND
Production Tool Co.

DAYTON
J. R. Kuntz Company

DETROIT
A. D. Spruce

HACKENSACK
The Eaton Company

INDIANAPOLIS
Don McIntire

MEMPHIS
Branch-Merwin Tool Specialists

MILWAUKEE
Ford Tool Company

MONTREAL
Humphrey B. Walton

NEW HYDE PARK
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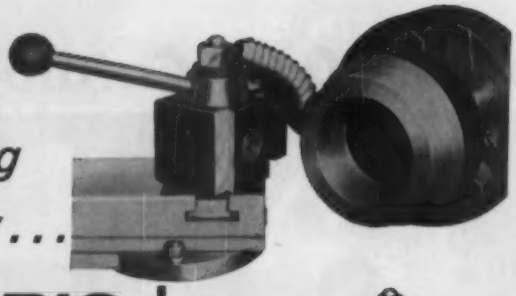
For Quick Changing Versatility...



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No other tool does all that the Aloris Tool Post does. No other Tool Holders can be changed so simply and accurately . . . and no other line is so complete!

You can change quickly and easily from one lathe operation to another. To remove the tool and tool holder you are working with, simply flip the handle and slide the tool holder out. Slide in the second tool holder, with the locked in tool bit in the exact pre-set position, flip the handle back and you're ready to run. What's more, you eliminate entirely the use of shims as each Aloris Tool Holder has its own built-in height adjustment.

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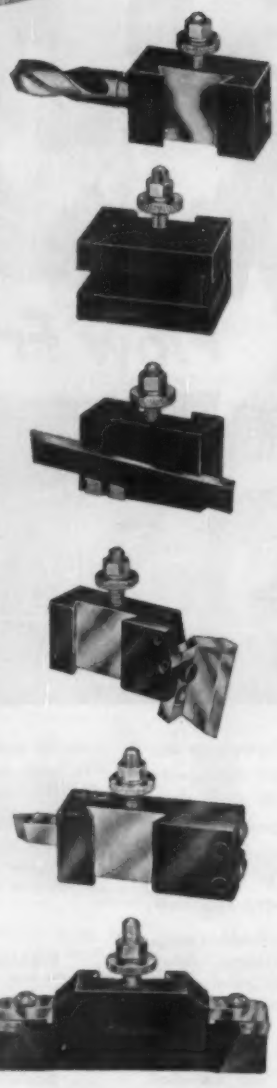

Write for information.

ALORIS
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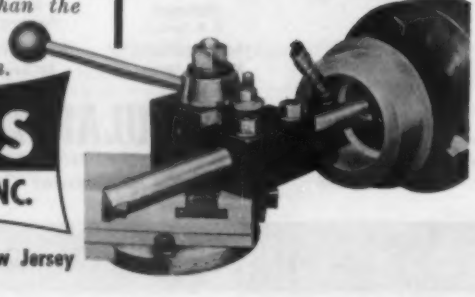

The text is based partly on a German-language book (1953), Hartstoffe und Hartmetalle, but it has obviously not been literally translated, and it includes new information on late developments in the field.

—CDE

LA MACHINE OUTIL (MACHINE TOOLS) VOL VII, MACHINING BY DEFORMATION. *Edited by A R Metral. Published by Dunod, 92 Rue Bonaparte, Paris, France. 452 pages, 10½ x 7¼. Price $14.00.*

Long in preparation, this volume, like the others of this monumental series, is not the work of any one man, but rather the combined effort of a whole group of authors, each a specialist in his own field.

The first chapter deals with the different kinds of mechanical deformation, metal flow as a function of time and temperature, testing methods and equipment, the influence of metallurgical factors on flow, and a study of the hot forming of steels. Chapter 2 covers the forgeability of metals and alloys, and chapter 3 deals with grain structure in plastic flow. Deformation of metals under stress is the subject of chapter 4, followed by an evaluation of the energy necessary for forging, and forging machines and their applications.

Sheet metal equipment covers some 80 pages and includes cutting machines of various types, including flame cutting and forming and bending machines. The remainder of the book is devoted to presswork of all kinds, including a special section on automotive work.

LA MACHINE OUTIL (MACHINE TOOLS) VOL VIII, MACHINING OF WOOD AND PLASTICS, AND MACHINE TOOL CONTROLS. *Edited by A R Metral. Published by Dunod, 92 Rue Bonaparte, Paris, France. 230 pages, 10½ x 7¼. Price $8.00*

Woodworking machines of all types are covered in the first part of this volume, followed by a brief section on the manufacture and use of reconstituted wood.

The second section concerns plastics, including the manufacture of sheet and extruded material, as well as the production of finished parts by compression and injection molding. There is also a short section on the machining of plastics.

The third section deals with electronic controls for machine tools, including programming, while the final section covers hydraulic and electro-hydraulic controls and gives

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From 1947 thru 1957, lost time eye injuries at Fairbanks, Morse & Co., Beloit Works, dropped over 98%. In 1958 and 1959 there were no lost time eye injuries.

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"We did not rush to put this program into effect. By the time we had all of the foremen convinced of the importance of eye protection (and because of the example they were setting), approximately 75% of the employees were also wearing eye protection. It was easy then to go all the way and the mandatory program went into operation June 1, 1948."

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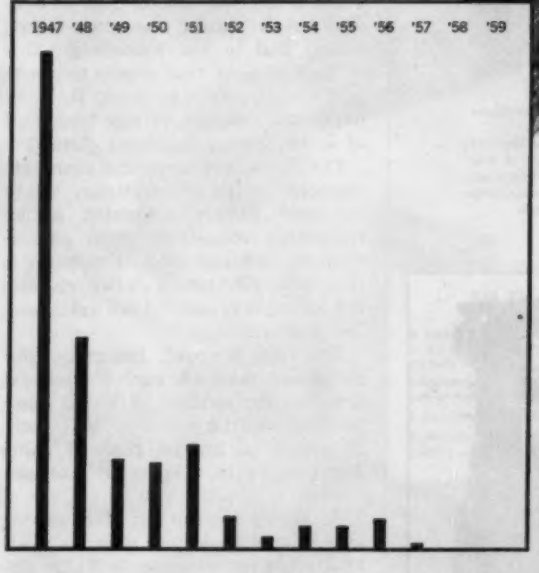
*Under Wisconsin Law minimum benefits paid to any employee for loss of vision in one eye is $9,250.



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details of the various types of pumps, valves, motors, and speed changers.

FLUSSIGKEITSGETRIEBE BEI WERKZEUGMASCHINEN (FLUID MECHANISMS FOR MACHINE TOOLS) *By Hans Krug. (2nd Edition) Published by Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 328 pages, 9 x 6¼. Price DM 39 ($10.00)*

Designed as a textbook on oil-hydraulic applications for machine tools, this new edition has been greatly enlarged and rewritten to bring it up to date with the latest developments in automatic machine tools.

The first section deals with the fundamentals of hydraulic mechanisms, and the second describes the various elements of hydraulic machinery, such as the different types of pumps, motors, filters, etc. The third section is concerned with the different types of machines to which hydraulics are applied, together with detailed drawings of the systems, and the final section with hydraulic presses.

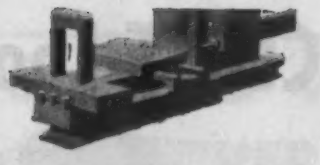
VALUE ENGINEERING—1959—*Proceedings of the EIA Conference on Value Engineering. Published by Engineering Publishers, PO Box 2, Elizabeth, NJ. 165 pages, 6 by 9 in. Price $6.*

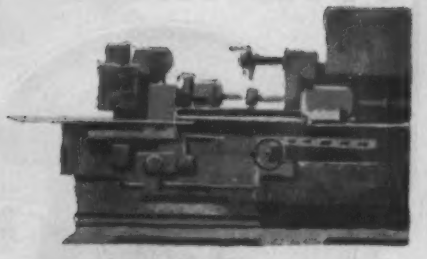
Value Analysis (or Value Engineering, as it is called here) has been a powerful cost-cutting tool in several areas during the past dozen years. But to our knowledge, this is the first book that covers this subject exclusively. As such, it is an important addition to any bookshelf of works on management control.

The book contains the complete versions (with illustrations) of 17 technical papers presented at an Electronic Industries Assn conference in October 1959. Emphasis is not upon electronics, however, and the concepts presented are valid ones for any industry.

Coverage is broad. Basically, four areas are covered, each by several articles: the concept of Value Engineering; military use of VE; techniques of VE; and the place of Value Engineering in a company's organization.

Although not the last word on the subject, the book does give the reader a clear introduction to Value Engineering. Subject matter is unified and well presented, well above the average of most books that reprint talks given at conferences—TJ





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Now even machines for which modern centralized lubrication was previously considered impractical can be equipped with a versatile, low-cost Accumite® System. The small size, simple installation and low cost of Alemite's Accumite System overcomes virtually every limitation regarding size and types of application.

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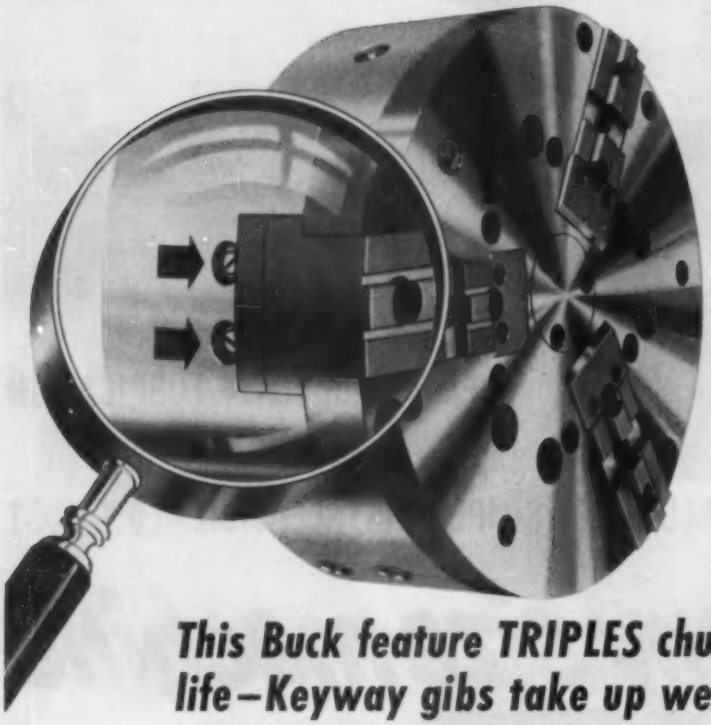

This Buck feature TRIPLES chuck life—Keyway gibs take up wear

You have some unbeatable profit-making features going for you with Buck Aluminum Body chucks. The easily-adjusted gibs to take up wear and prevent bell-mouthing are just one advantage.

Aluminum body and new design master jaws *save 40% of conventional chuck weight* . . . increase efficiency, save machine wear.

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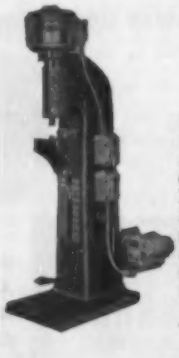

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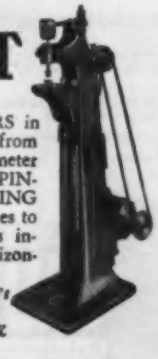

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HI-PRODUCTION AUTOMATIC PRESSES

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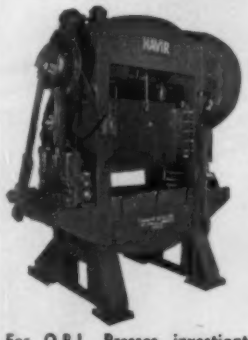

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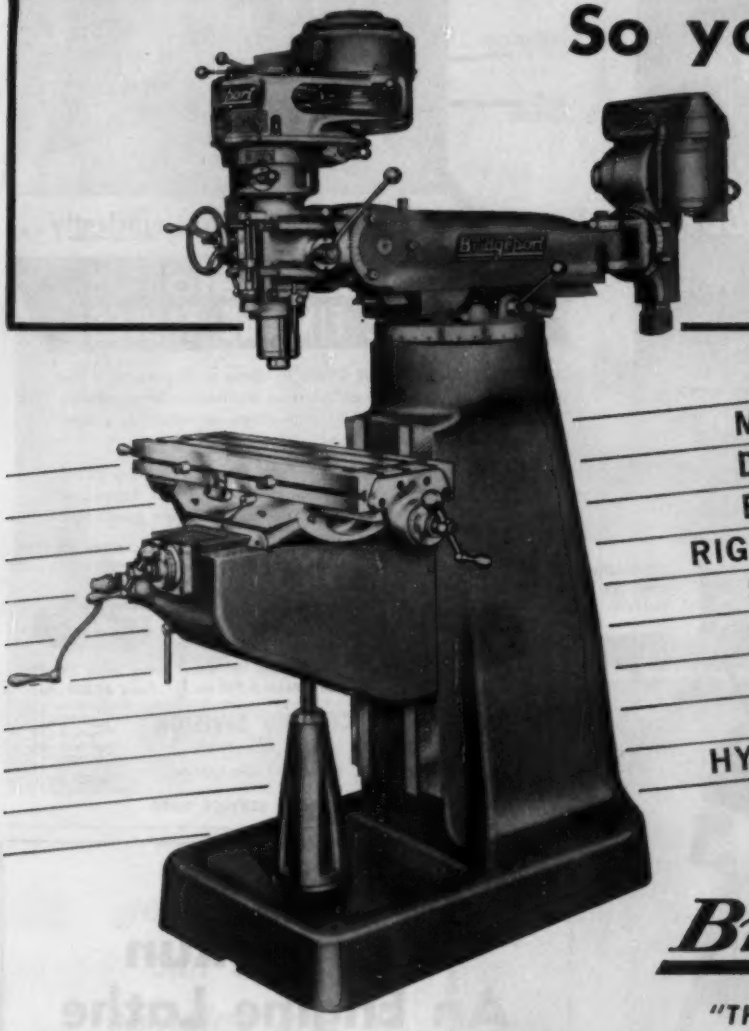

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. . . all operations featured here are performed on BRIDGEPORT TURRET MILLING MACHINES, at all angles of the work, without changing set up.

. . . production speeds for a wide range of work with precision maintained.

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. . . small shops as well as large are assured attractive returns on a modest investment within the reach of all.

. . . a machine where price has been maintained on a remarkably even keel under constantly rising costs of manufacture and where quality, capacity and range of operations have been stepped up and extended year after year.

. . . where versatility has been extended through constant development of attachments.

These are a few of the many reasons why BRIDGEPORT can logically stress "VERSATILITY" and why the "Most for the Least" is an accurate way to describe this outstanding machine tool.

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MANUAL OR POWER-OPERATED MODELS
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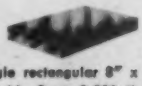

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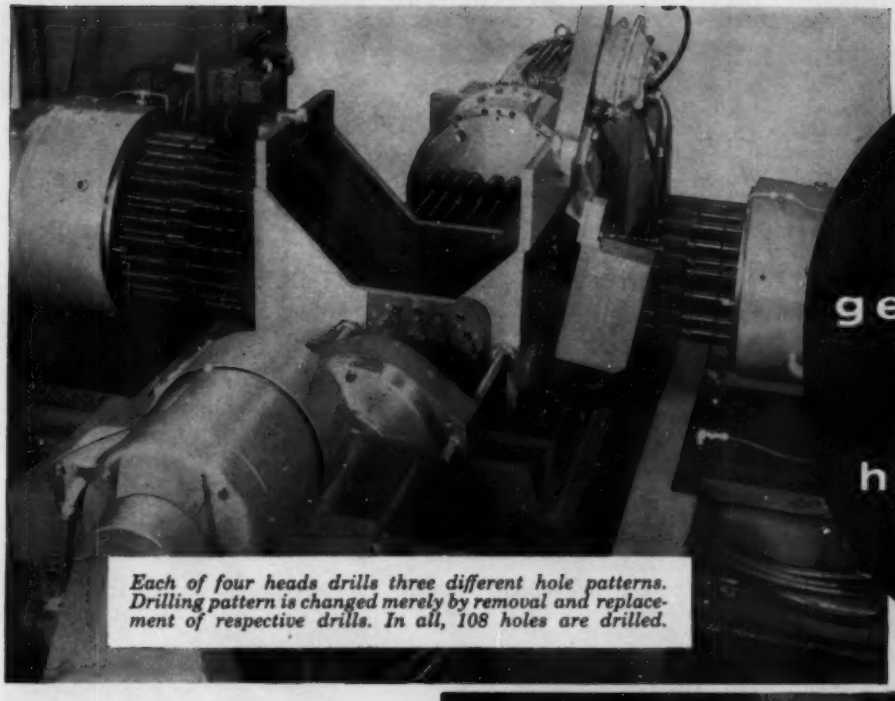

Each of four heads drills three different hole patterns. Drilling pattern is changed merely by removal and replacement of respective drills. In all, 108 holes are drilled.

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gearless design can use more spindles and do more work

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When drilling, reaming and tapping on more than one part, Zagar can often apply one head to do several patterns. Zagar heads drill, ream, and tap varying diameters on any center.

Write for Engineering Manual A-2 for technical reference.

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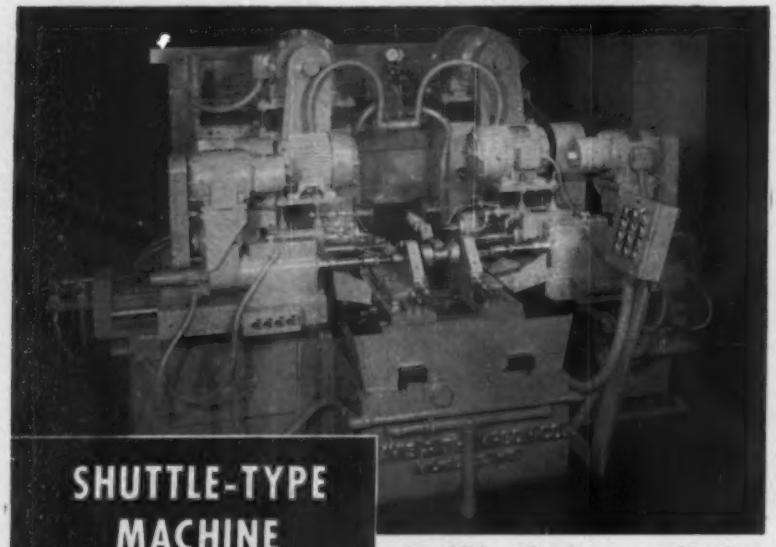
USE MORE SPINDLES TO DO MORE WORK



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. . . Mills, Centers, Tap Drills and Taps in #316 Stainless

Here's a good example of engineering a semi-standard machine to handle a lot of parts. Although this machine has been adapted to milling, centering, drilling and tapping of valve parts, its basic design lends itself to other operations through the addition of various types of heads as well as multiple spindle drill heads. Machine incorporates hydraulic controls for table feed and index, two milling heads, two hydraulic power heads, each with center drill and tap drill spindle, and two mechanical screw feed tapping heads to accommodate 16, 20 and 24 pitch threads. Capacities range from ⅜" to 4½" diameter, 5" to 23" long. Parts are inner valves for liquid level controls of tough #316 stainless steel.

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- for FINER FINISH
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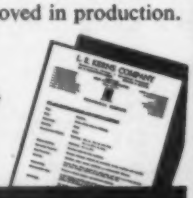
We supply material for production test . . . no formal invoice rendered unless completely approved in production.

Write for Technical Data Sheet SGC-6560.



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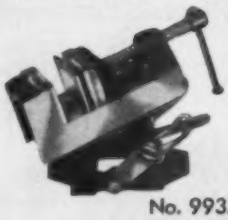

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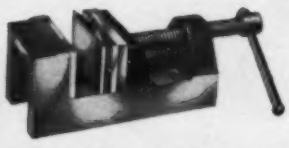

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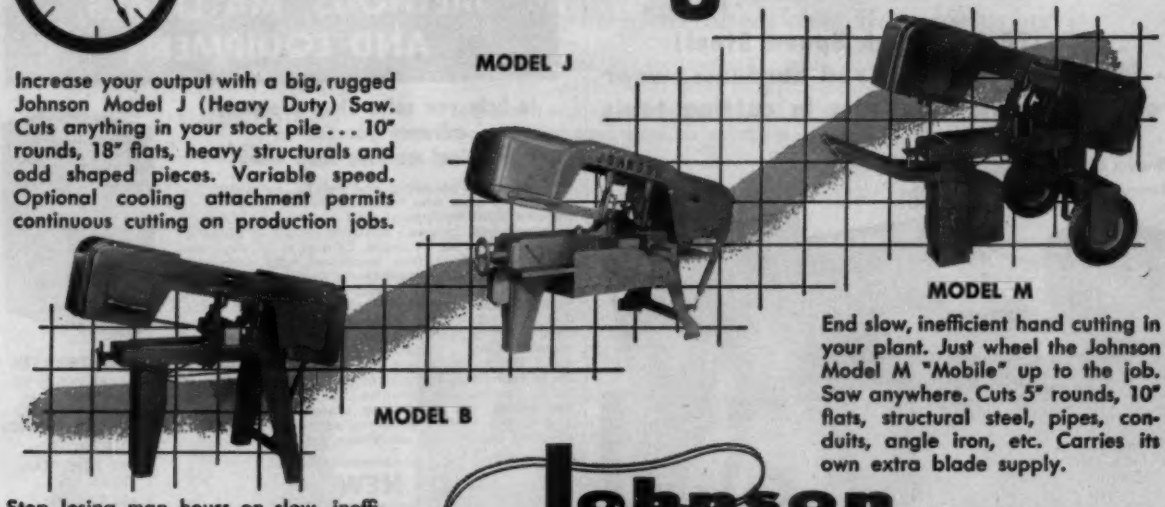

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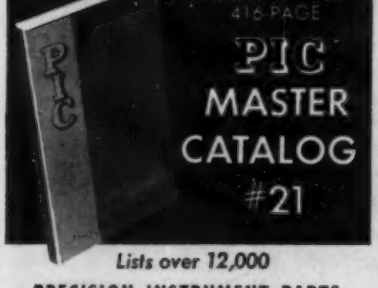

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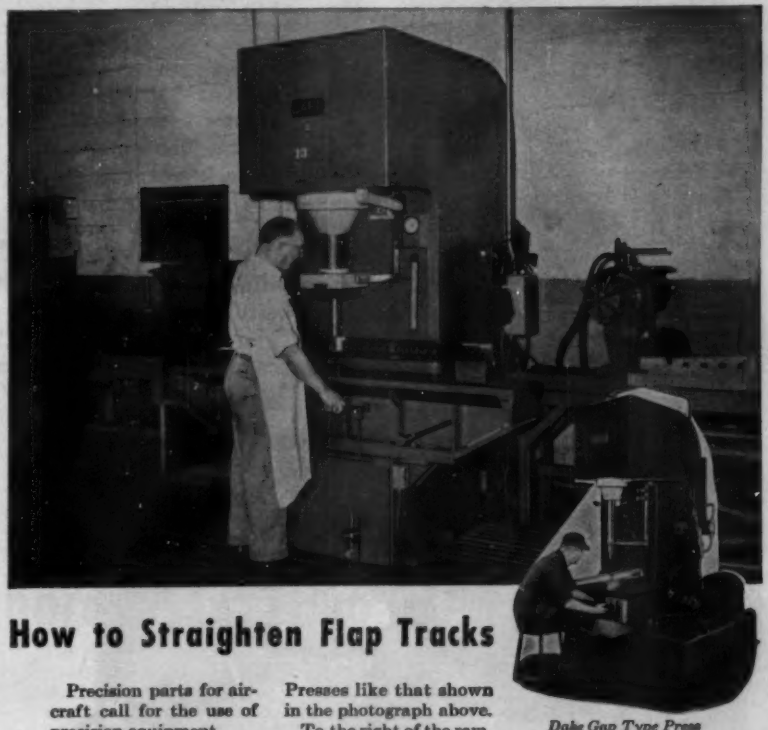

Dake Gap Type Press broaches boring bars

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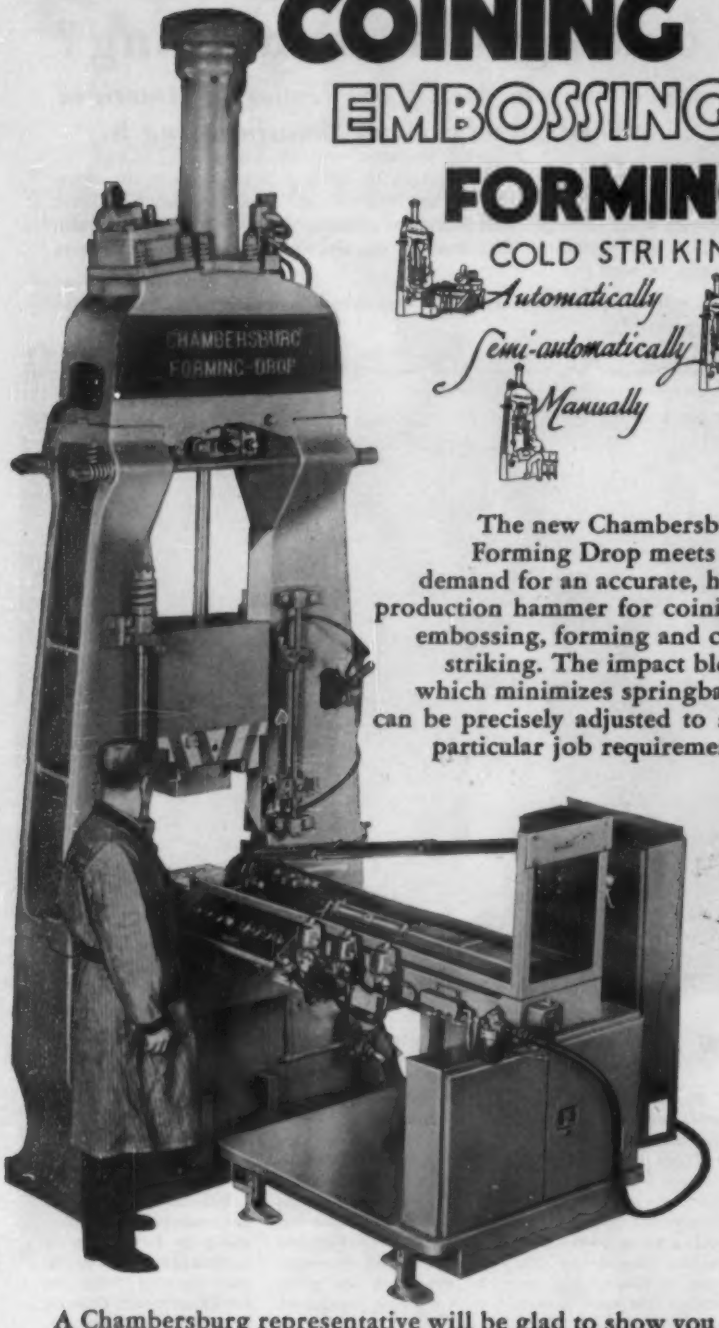

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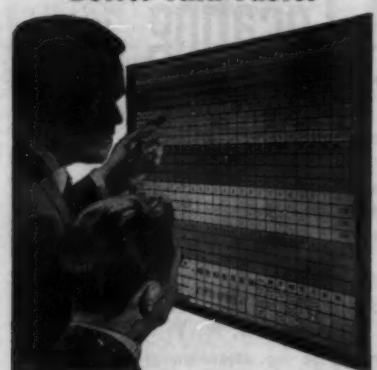

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2. Automatics
5. Bolt Machines
6. Boring Mills
7. Broaching Machines
9. Centering Machines
11. Compressors
16. Drilling & Reaming Machines
20. Forging Equipment
23. Gear Cutting Machines
24. Grinding Machines
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29. Lathes
33. Milling Machines
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LATHES

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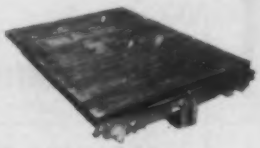

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Grinders, Centerless, Filmatic, late (2)
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BIG CROWD

When a production man needs something—equipment, accessories, materials or supplies—he usually wants it in a hurry. The best place to find out "where to buy it" for Metalworking is the American Machinist/Metalworking Manufacturing Buyers' Guide.

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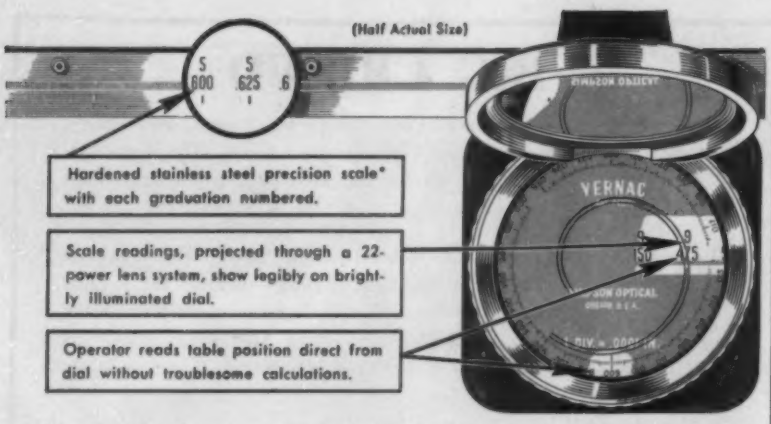
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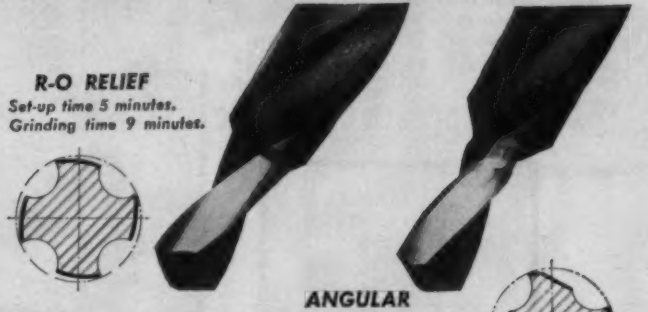

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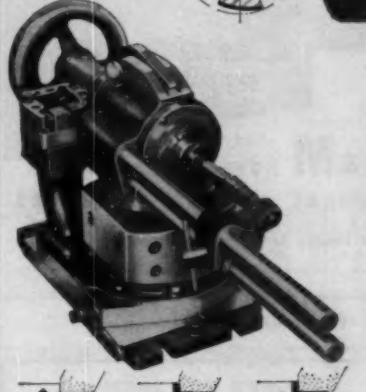

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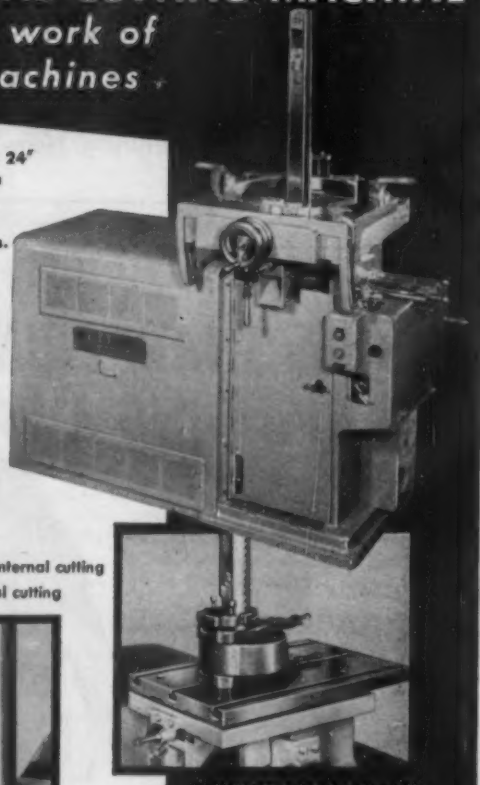
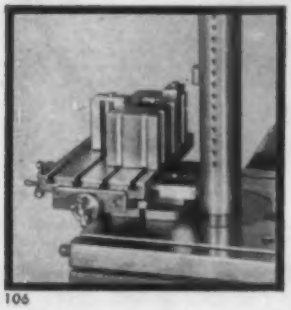


Right: Set-up for internal cutting
Below: Set-up for external cutting



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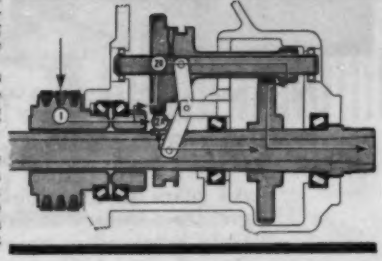

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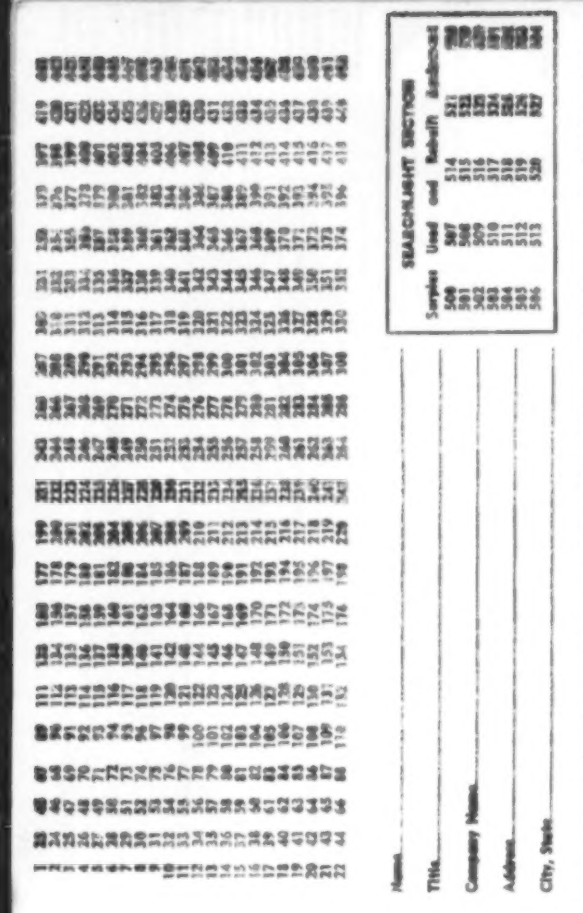

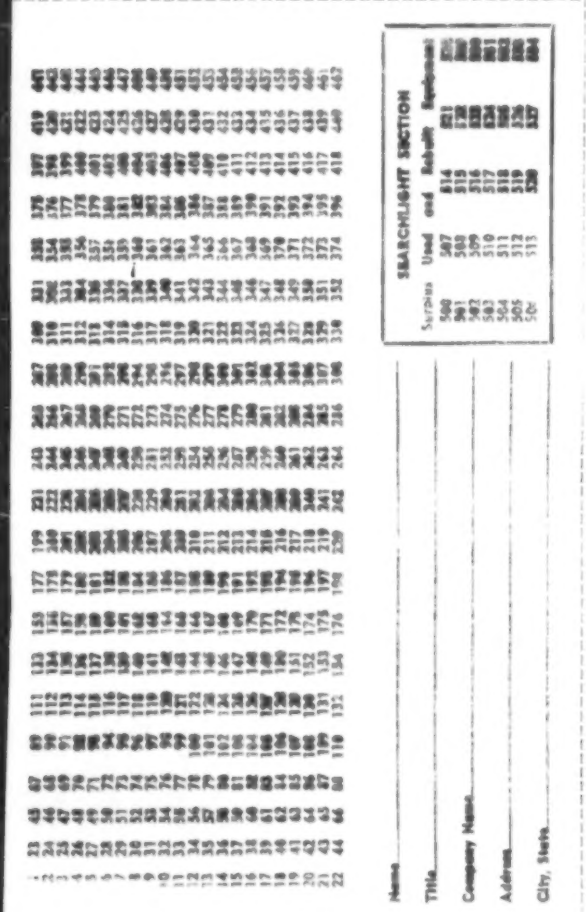

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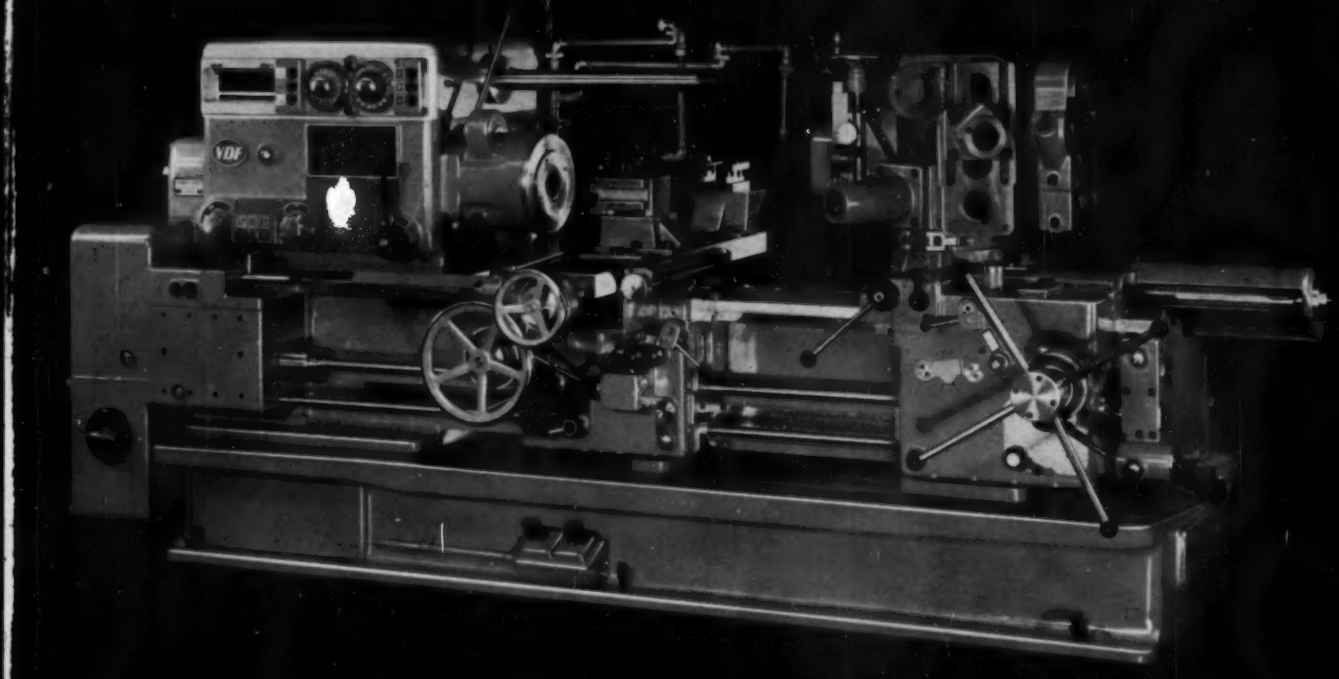

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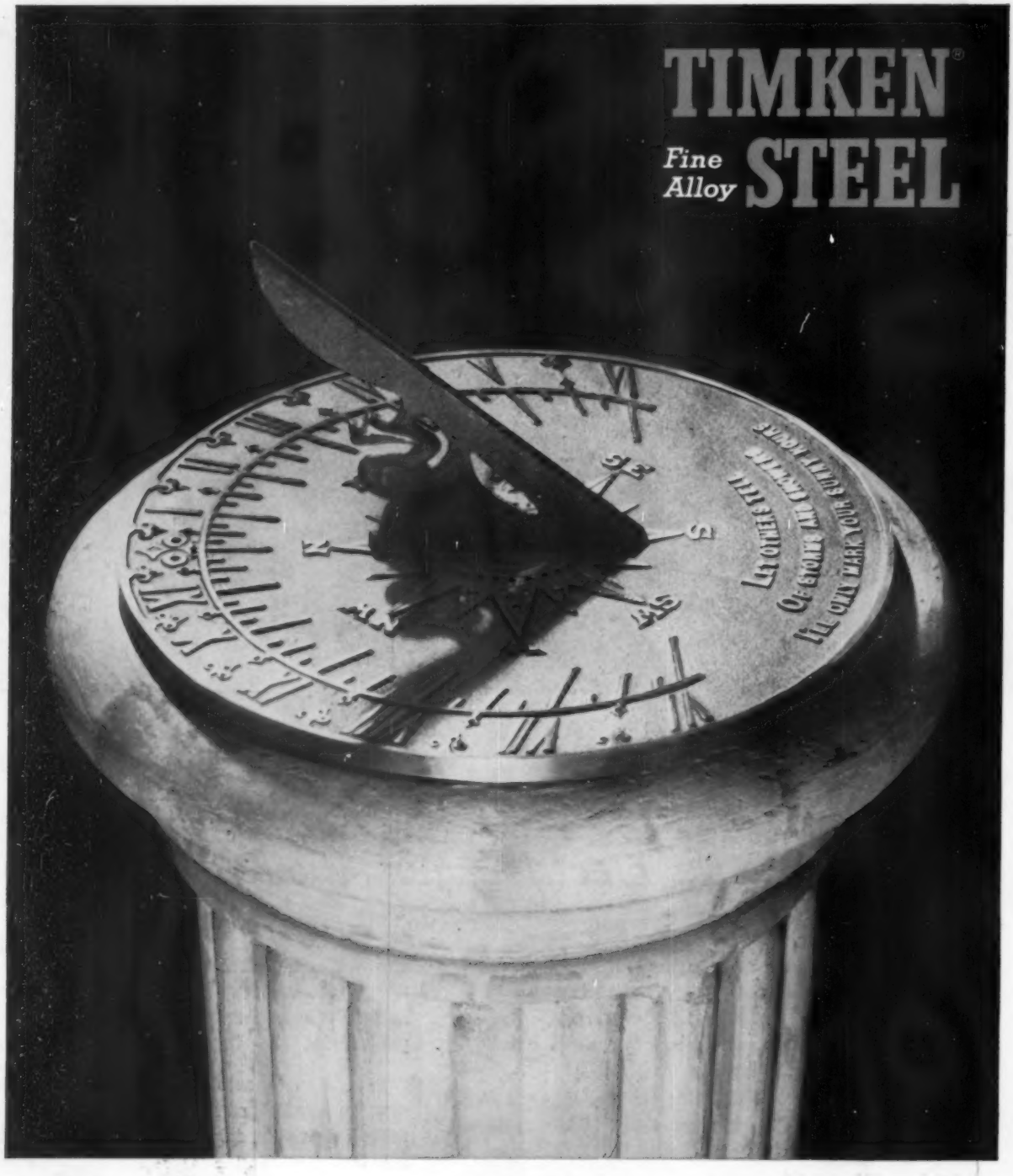

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